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VERIFICATION IN ALL ITS ASPECTS

Study on the role of the United Nations in the field of verification

Note by the Secretary-General

The Secretary-General has the honour to submit herewith the report of the Group of Qualified Governmental Experts to Undertake a Study on the Role of the United Nations in the Field of Verification. The governmental experts were appointed in accordance with General Assembly resolution 43/81 B of 7 December 1988, which requested the Secretary-General to undertake, with the assistance of a group of qualified governmental experts, an in-depth study of the role of the United Nations in the field of verification and to submit a comprehensive report on the subject to the Assembly at its forty-fifth session.

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* A/45/150 and Corr.1.

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ANNEX

Study on the role of the United Nations in the field of verification

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ABBREVIATIONS

Acronyms and abbreviations used in the text

APSI	Agency for the processing of satellite images
CBT (weapons)	Chemical and bacteriological (biological) or toxin (weapons)
CCD	Conference of the Committee on Disarmament
CSBMs	Confidence- and security-building measures
CSCE	Conference on Security and Co-operation in Europe
COMSENS	Acronym used to describe a Swedish independent data exchange satellite system to be established for the sole purpose of exchanging verification data in arms limitation and disarmament treaties
CW	Chemical weapons
FAO	Food and Agriculture Organization of the United Nations
GSETT	Group of seismic experts technical test
GTS	Global Telecommunications System
IAEA	International Atomic Energy Agency
IDCs	International data centres
ISMA	International satellite monitoring agency
NDCs	National data centres
NTM	National technical means
OSIs	On-site inspections
PAXSAT	Acronym used to describe a Canadian project that assesses the feasibility of applying space-based remote-sensing technology to the tasks of verification of arms limitation and disarmament agreements
PI	Photo-interpreter
RPVs	Remotely piloted vehicle
SAR	Synthetic aperture radar
SCC	Standing Consultative Commission (established in connection with the SALT I Interim Agreement and the ABM Treaty)
SIPRI	Stockhold International Peace Research Institute
SPOT	Système probatoire d'observation de la terre (used to describe the French space-based remote-sensing system)

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SVC	Special Verification Commission (established in connection with the INF Treaty)
UNIDIR	United Nations Institute for Disarmament Research
WHO	World Health Organization
WMO	World Meteorological Organization

GLOSSARY

Full name of agreements mentioned in the text

Geneva Protocol	Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare
Antarctic Treaty	The Antarctic Treaty
Partial Test Ban Treaty (PTBT)	Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water
Outer Space Treaty	Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies
Treaty of Tlatelolco	Treaty for the Prohibition of Nuclear Weapons in Latin America
Non-Proliferation Treaty (NPT)	Treaty on the Non-Proliferation of Nuclear Weapons
Sea-Bed Treaty	Treaty on the Prohibition of The Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and the Subsoil Thereof
Biological Weapons Convention	Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction
Environmental Modification Convention (ENMOD)	Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques
Agreement on the Moon and other Celestial Bodies	Agreement Governing the Activities of States on the Moon and Other Celestial Bodies
Convention on Certain Conventional Weapons (Inhumane Weapons Convention)	Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to be Excessively Injurious or to Have Indiscriminate Effects
Treaty of Rarotonga	South Pacific Nuclear-Free Zone Treaty

CSCE: Document on CBMs and certain aspects of security and disarmament	Conference on Security and Co-operation in Europe: Final Act - Document on confidence-building measures and certain aspects of security and disarmament
Document of the Stockholm Conference (Stockholm Document)	Document of the Stockholm Conference on Confidence- and Security-building Measures and Disarmament in Europe, convened in accordance with the relevant provision of the Concluding Document of the Madrid Meeting of the Conference on Security and Co-operation in Europe
INF Treaty	Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles
Anti-Ballistic Missile Treaty (ABM Treaty)	Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missiles Systems
SALT I	Interim Agreement between the United States of America and the Union of Soviet Socialist Republics on Certain Measures with Respect to the Limitation of Strategic Offensive Arms
SALT II	Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms

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FOREWORD BY THE SECRETARY-GENERAL

During recent years, interest has quickened concerning the issue of multilateral verification. In the Final Document of the Tenth Special Session of the General Assembly, the first special session devoted to disarmament, it was stated that:

> "Disarmament and arms limitation agreements should provide for adequate measures of verification satisfactory to all parties concerned in order to create the necessary confidence and ensure that they are being observed by all parties ... Agreements should provide for the participation of parties directly or through the United Nations system in the verification process." 1/

Since 1985, in successive annual reports to the General Assembly on the work of the Organization, the Secretary-General has drawn attention to the need to explore the ability of the United Nations to assist in the verification and compliance arrangements of multilateral arms limitation and disarmament agreements.

On 16 December 1985, the General Assembly adopted resolution 40/152 O, entitled "Verification in all its aspects" and, since that time, there have been a number of initiatives and proposals by groups of Member States, by the Heads of State and Government comprising the Six-Nation Initiative, and by individual Member States. In 1988, the Disarmament Commission reached agreement on a set of 16 principles, subsequently endorsed by the General Assembly, and later that year, by its resolution 43/81 B of 7 December 1988, the Assembly requested the Secretary-General to undertake, with the assistance of a group of qualified governmental experts, an in-depth study of the role of the United Nations in the field of verification.

The report of the Group of Qualified Governmental Experts concludes that the United Nations will need to address the multilateral aspects of verification with increasing attention. The Group further recognizes that the dynamic development of the world situation and possible rapid progress of arms limitation and disarmament negotiations may introduce new schedules and approaches for United Nations involvement in verification.

At the same time, however, the Group observes that United Nations involvement should be an evolutionary process. Involvement by the Organization, in whatever form, can only be at the request of States parties to specific arms limitation and disarmament agreements and with the authorization of its governing body, the General Assembly. It is in this spirit that the Group sets out a number of possible measures, in increasing order of practicability, cost and time-frame.

There can be no doubt that for participating States in a multilateral arms limitation and disarmament agreement, multilateral verification arrangements will be essential to create and develop mutual confidence in compliance. As an organization with global membership and a recognized responsibility for the maintenance of international peace and security, it is entirely appropriate that the United Nations should be at the forefront of international efforts regarding such arrangements.

The Secretary-General expresses his appreciation to the members of the Group of Qualified Governmental Experts for their report, which is hereby submitted to the General Assembly for its consideration. It should be noted that the observations, conclusions and recommendations in the report are those of the members of the Group and that the Secretary-General is not in a position to pass judgement on all aspects of their work.

Notes

1/ General Assembly resolution S-10/2.

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LETTER OF TRANSMITTAL

13 July 1990

Sir,

I have the honour to submit herewith the report of the Group of Qualified Governmental Experts to Undertake a Study on the Role of the United Nations in the Field of Verification, which was appointed by you in pursuance of paragraph 4 of General Assembly resolution 43/81 B of 7 December 1988.

The Governmental Experts appointed by you were the following:

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Dr. Ján Chandoga
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Major D. T. Etela
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Directorate of Research and Development
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Ambassador Roberto García Moritán
Permanent Representative of Argentina to the Conference on Disarmament
Mission of Argentina for Disarmament
Geneva, Switzerland

Ambassador Carl-Magnus Hyltenius
Permanent Representative of Sweden to the Conference on Disarmament
Mission of Sweden for Disarmament
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The report was prepared between February 1989 and July 1990, during which period the Group held four sessions in New York, the first from 13 to 17 February 1989, the second from 24 July to 4 August 1989, the third from 8 to 19 January 1990, and the fourth from 2 to 13 July 1990.

The Group of Experts wishes to thank the Government of Canada for organizing, in the course of its second session, a two-day workshop on legal and technical issues relating to verification. The workshop was held on 24 and 25 July 1989 in Montreal, Canada, with sessions taking place at the Centre for Research on Air and Space Law at McGill University, and at SPAR Aerospace Ltd. The visit to SPAR also included a detailed tour of its facilities. The Group of Experts felt that the workshop was most useful in broadening its understanding of the issues involved and highly beneficial to its work on the report. The members of the Group of Experts wish to express special appreciation to the following individuals: Dr. Nicholas M. Matte, Dr. Jean-Louis Magdelenat, and Dr. Lucy Stojak of the Centre for Research on Air and Space Law, McGill University; Dr. F. J. F. Osborne and Mr. Peter Stibrany of SPAR Aerospace Ltd.; and Dr. Howard Mann, Department of Justice, Canada.

In carrying out its work, the Group had before it publications and papers on various issues of relevance to the report that were circulated by members of the Group. In addition, the United Nations Institute for Disarmament Research contributed to the Group's work by engaging Dr. Allan Din to prepare a technical paper for the attention of the Group.

The members of the Group of Experts wish to express their gratitude for the assistance that they received from members of the Secretariat of the United Nations. They wish, in particular, to thank Mr. Yasushi Akashi, Under-Secretary-General for Disarmament Affairs, Mr. Derek Boothby, who served as Secretary of the Group, Ms. Silvana F. da Silva, who served as Deputy-Secretary of the Group, and Mr. Michael Krepon who served in his private capacity as Consultant to the Secretariat.

I have been requested by the Group of Governmental Experts, as its Chairman, to submit to you, on its behalf, this report which was unanimously approved.

Please accept, Sir, the assurances of my highest consideration.

(_Signed_) Fred BILD
Chairman of the
Group of Qualified Governmental Experts
to Undertake a Study on the Role of the
United Nations in the Field of Verification

I. INTRODUCTION

1. Since its inception, the United Nations has addressed the question of verification at both the deliberative and the negotiating forums. Disarmament proposals put forward since then, regardless of which State or group of States sponsored them, included reference to the need for an effective system of control. A testimony to the ever-increasing attention this area has received within the United Nations is reflected in the three special sessions of the General Assembly devoted to disarmament as well as in the work on this subject that has been done in various United Nations bodies. The introduction of an item entitled "General and complete disarmament" in the agenda of the General Assembly, in 1959, also attracted increased attention to the issue of control/verification in the disarmament process. General Assembly resolution 1378 (XIV) of 20 November 1959 explicitly stated for the first time that "general and complete disarmament under effective international control" (emphasis added) was the goal of the United Nations disarmament efforts.

2. The importance of the control/verification of disarmament measures was further reiterated in the Joint Statement of Agreed Principles for Disarmament Negotiations (the so-called McCloy-Zorin Agreement) submitted by the Union of Soviet Socialist Republics and the United States of America to the General Assembly on 20 September 1961. The Statement pointed out that "disarmament measures should be implemented from beginning to end under such strict and effective international control as would provide firm assurance that all parties are honouring their obligations". To implement the proposed system of control, the sponsors recommended the creation of an international disarmament organization, within the framework of the United Nations, composed of all parties to the agreement.

3. During the 1960s and 1970s, consideration of the question of verification of multilateral arms limitation and disarmament agreements was primarily carried out within the framework of the various partial measures which were then being pursued concurrently with the more far-reaching objectives of general and complete disarmament. Even so, adequate verification provisions were not present in some of the agreements concluded during those years (see table in section IV of the present report).

4. In 1978, the General Assembly, at its first special session devoted to disarmament, identified in the Final Document of the Tenth Special Session of the General Assembly (Assembly resolution S-10/2), adopted at the conclusion of the session several broad principles on which verification provisions should be based in order to serve their intended purposes and gain general support of the parties to an agreement.

5. The growing recognition by the international community that disarmament and arms limitation agreements should provide for adequate measures of verification satisfactory to all parties concerned in order to create the necessary confidence and ensure that they are being observed by all parties led the General Assembly to adopt, on 16 December 1985, a new resolution (40/152 O) entitled "Verification in all its aspects".

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6. By that resolution, the Secretary-General was requested to prepare and submit to the General Assembly at its forty-first session a report containing the views and suggestions of Member States on verification principles, procedures and techniques for promoting the inclusion of adequate verification in arms limitation and disarmament agreements and on the role of the United Nations in the field of verification. That report was issued in 1986 as a document of the General Assembly (A/41/422 and Add.1 and 2).

7. General Assembly resolutions 41/86 Q of 4 December 1986 and 42/42 F of 30 November 1987 followed. By those resolutions the Disarmament Commission was requested to consider the issue of verification in all its aspects, including the role of the United Nations and its Member States in the field of verification, and to report on its deliberations, conclusions and recommendations to the General Assembly. The Secretary-General was also requested to prepare for the 1987 and 1988 sessions of the Disarmament Commission compilations of the views received from Member States on the issue (A/CN.10/87 and Add.1 and 2 and A/CN.10/106 and Add.1 to 3). Assembly resolution 42/42 F was particularly significant as it established for the first time the subject of "Verification in all its aspects" as an independent item in the provisional agenda of the forty-third session of the General Assembly.

8. In its 1988 substantive session, the Disarmament Commission reached agreement on a text containing a set of 16 principles of verification, a section on provisions and techniques of verification, and views on the role of the United Nations and its Member States in the field of verification. That text was contained in the report of the Disarmament Commission transmitted to the General Assembly at its Fifteenth Special Session, the third special session devoted to disarmament 1/ held in June 1988. Deliberations on the issue of verification at the special session revolved primarily around the question of the role of the United Nations in the field of verification. Although there seemed to be an emerging consensus on the formulations regarding the verification study, the special session as a whole was inconclusive.

9. At its forty-third session, the General Assembly had before it two draft resolutions dealing with the question of verification at the multilateral level, one initiated by Canada, France and the Netherlands, the other sponsored by the countries represented in the Six-Nation Initiative: Argentina, Greece, India, Mexico, Sweden and United Republic of Tanzania. Extensive negotiations between the sponsors of the two drafts resulted in the introduction of a third draft which reflected the willingness of the parties involved to compromise on their differing approaches in order to obtain the broadest possible support in the General Assembly.

10. The new draft was adopted by the General Assembly, on 7 December 1988, as resolution 43/81 B. In the resolution, the General Assembly, inter alia, reiterated its view that agreements should provide for the participation of parties directly or through the United Nations organs in the verification process and stated that it was conscious of the fact that the United Nations is already playing a useful role in the field of verification. The resolution further recognized that the United Nations, in accordance with its role and responsibilities established under the Charter of the United Nations, can make a significant contribution in the

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field of verification, in particular of multilateral agreements. It requested the Secretary-General to undertake, with the assistance of a group of qualified governmental experts, an in-depth study of the role of the United Nations in the field of verification that would: (a) identify and review existing activities of the United Nations in the field of verification of arms limitation and disarmament; (b) assess the need for improvements in existing activities as well as explore and identify possible additional activities, taking into account organizational technical, operational, legal and financial aspects; and (c) provide specific recommendations for future action by the United Nations in this context. The Secretary-General was requested to submit a comprehensive report on the subject to the General Assembly at its forty-fifth session.

11. The present report has been prepared pursuant to General Assembly resolution 43/81 B. The Group of Governmental Experts, while taking fully into account the mandate of the resolution, that is, to prepare a study that addresses the role of the United Nations in the field of verification of arms limitation and disarmament, has also taken into consideration approaches, methods, procedures and techniques relating to other arrangements in the area of international peace and security which might otherwise be useful to the process of verification of arms limitation and disarmament agreements.

Notes

1/ Official Records of the General Assembly, Fifteenth Special Session, Supplement No. 3 (A/S-15/3).

II. VERIFICATION: DEFINITION AND FUNCTIONS

A. Definition of terms

12. Verification is a process which establishes whether the States parties are complying with their obligations under an agreement. The process includes: collection of information relevant to obligations under arms limitation and disarmament agreements; analysis of the information; and reaching a judgement as to whether the specific terms of an agreement are being met. The context in which verification takes place is that of the sovereign right of States to conclude and their obligation to implement arms limitation and disarmament agreements. Verification is conducted by the parties to an agreement, or by an organization at their request.

13. This agreement-specific approach to defining verification for arms limitation and disarmament does not preclude useful research into and examination of general concepts and even particular verification techniques in advance of negotiated agreements. This type of generic, anticipatory or complementary work, however, is essentially of an exploratory nature, focused on developing new knowledge that can be employed subsequently in designing, implementing and strengthening agreement-specific verification systems. Sometimes it may be aimed at actually setting up operating verification systems in advance of relevant arms limitation and disarmament agreements with a view to promoting their conclusion. However, the expense of operational verification systems may hamper their formation in advance of actual agreements, given that there are no obligations to be verified until specific agreements are concluded and that verification depends on the purpose, scope and nature of the agreement.

14. Compliance refers to the actual behaviour of a party with respect to the provisions of a binding agreement. It denotes behaviour that is in accordance with the forms and requirements of the agreement.

15. The process of verifying compliance with arms limitation and disarmament agreements consists of multiple steps that can be either unilateral or co-operative in nature, or a combination of both. The initial steps involve monitoring, examining and analysing information relating to compliance.

16. Monitoring/data collection: monitoring is the process of watching, observing or checking objects, activities or events, for a specific purpose. It is one generic form of information collection, which can include other activities such as exchanges of information. Monitoring, and data collection in general, constitute the first step in the verification process. In verification, this information is collected for the purpose of assessing compliance with a binding agreement.

17. Monitoring/data collection and analysis can be undertaken for a much wider range of purposes than verification including, inter alia, crisis prevention, peace-keeping and general intelligence gathering. Verification procedures must be carefully designed to prevent, as far as possible, collection of data unrelated to the purpose of verifying the treaty concerned.

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18. Verification arrangements for arms limitation and disarmament agreements may entail co-operative measures, or provisions between States parties that simplify or facilitate monitoring of compliance with an agreement's provisions. As trust in faithful compliance with agreements between States increases over time, the relative importance of monitoring can change, without necessarily leading to changes in treaty obligations.

19. Arms limitation and disarmament agreements may require asymmetrical reductions to arrive at equal levels of armament, or differing verification burdens, reflecting the specific provisions agreed to by States parties. Whatever the verification arrangements that are agreed, they must not, however, be implemented in a discriminatory manner; otherwise, they can generate mistrust or resentment over time. States parties must have the right to participate fully in co-operative verification arrangements agreed upon during the course of negotiations.

20. Terms such as "adequate", "effective", or "appropriate" are often used to express the standard of verification deemed necessary for States to consent to limitations on their military capabilities and freedom of action. Whatever the terminology used, there is widespread recognition that no verification régime can uncover every conceivable problem. Instead, verification provisions and monitoring capabilities should be designed so that violations are detected in time for the States parties to take appropriate action.

21. The definitions reviewed here suggest that verification entails political as well as technical considerations. States parties commit themselves to carrying out agreed obligations fully, including the obligation to permit verification of compliance and to resolve concerns over non-compliance in a satisfactory manner. The importance of the political elements of the verification process is also underscored by the co-operative arrangements that accompany the implementation of agreed obligations, including highly intrusive verification arrangements such as on-site inspections (OSIs). As will be discussed below, agreed obligations may take legal or moral form, depending on the nature of the agreements reached. As is evident from the discussion above, there is also an essential role for expertise in monitoring the implementation of agreed obligations. Future advances in verification technologies would facilitate the conclusion of arms limitation and disarmament agreements. International co-operation in the development of verification technologies would therefore be most valuable.

B. Principles of verification

22. An important aspect of efforts in the field of arms limitation and disarmament undertaken within the United Nations has been the development of broad principles on which verification provisions should be based. The General Assembly at its tenth special session, the first special session devoted to disarmament, held in 1978, formalized some basic concepts on the subject. Included in the Final Document of the Tenth Special Session of the General Assembly were three paragraphs that can be regarded as the precursors, within the United Nations framework, of later efforts to develop a full set of principles of verification. The three paragraphs read as follows:

"Disarmament and arms limitation agreements should provide for adequate measures of verification satisfactory to all parties concerned in order to create the necessary confidence and ensure that they are being observed by all parties. The form and modalities of the verification to be provided for in any specific agreement depend upon and should be determined by the purposes, scope and nature of the agreement. Agreements should provide for the participation of parties directly or through the United Nations system in the verification process. Where appropriate, a combination of several methods of verification as well as other compliance procedures should be employed.

"...

"In order to facilitate the conclusion and effective implementation of disarmament agreements and to create confidence, States should accept appropriate provisions for verification in such agreements.

"In the context of international disarmament negotiations, the problem of verification should be further examined and adequate methods and procedures in this field be considered. Every effort should be made to develop appropriate methods and procedures which are non-discriminatory and which do not unduly interfere with the internal affairs of other States or jeopardize their economic and social development." 1/

23. In 1988, the General Assembly endorsed a set of 16 principles of verification developed by the Disarmament Commission (Assembly resolution 43/81 B). The 16 principles resulted partly from the preceding three paragraphs of the Final Document, which were used as a basis for the work of the Commission. The principles, which could be useful guidelines in the negotiations of arms limitation and disarmament agreements, are:

"(1) Adequate and effective verification is an essential element of all arms limitation and disarmament agreements.

"(2) Verification is not an aim in itself, but an essential element in the process of achieving arms limitation and disarmament agreements.

"(3) Verification should promote the implementation of arms limitation and disarmament measures, build confidence among States and ensure that agreements are being observed by all parties.

"(4) Adequate and effective verification requires employment of different techniques, such as national technical means, international technical means and international procedures, including on-site inspections.

"(5) Verification in the arms limitation and disarmament process will benefit from greater openness.

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"(6) Arms limitation and disarmament agreements should include explicit provisions whereby each party undertakes not to interfere with the agreed methods, procedures and techniques of verification, when these are operating in a manner consistent with the provisions of the agreement and generally recognized principles of international law.

"(7) Arms limitation and disarmament agreements should include explicit provisions whereby each party undertakes not to use deliberate concealment measures which impede verification of compliance with the agreement.

"(8) To assess the continuing adequacy and effectiveness of the verification system, an arms limitation and disarmament agreement should provide for procedures and mechanisms for review and evaluation. Where possible, time-frames for such reviews should be agreed in order to facilitate this assessment.

"(9) Verification arrangements should be addressed at the outset and at every stage of negotiations on specific arms limitation and disarmament agreements.

"(10) All States have equal rights to participate in the process of international verification of agreements to which they are parties.

"(11) Adequate and effective verification arrangements must be capable of providing, in a timely fashion, clear and convincing evidence of compliance or non-compliance. Continued confirmation of compliance is an essential ingredient to building and maintaining confidence among the parties.

"(12) Determinations about the adequacy, effectiveness and acceptability of specific methods and arrangements intended to verify compliance with the provisions of an arms limitation and disarmament agreement can only be made within the context of that agreement.

"(13) Verification of compliance with the obligations imposed by an arms limitation and disarmament agreement is an activity conducted by the parties to an arms limitation and disarmament agreement or by an organization at the request and with the explicit consent of the parties, and is an expression of the sovereign right of States to enter into such arrangements.

"(14) Requests for inspections or information in accordance with the provisions of an arms limitation and disarmament agreement, should be considered as a normal component of the verification process. Such requests should be used only for the purposes of the determination of compliance, care being taken to avoid abuses.

"(15) Verification arrangements should be implemented without discrimination, and, in accomplishing their purpose, avoid unduly interfering with the internal affairs of State parties or other States, or jeopardizing their economic, technological and social development.

> "(16) To be adequate and effective, a verification régime for an agreement must cover all relevant weapons, facilities, locations, installations and activities." 2/

C. Functions

1. General

24. Verification provisions have several important functions, beginning with the assessment of how implementation of arms limitation and disarmament is proceeding. For this process to succeed in the long term, verification provisions must provide for confidence in compliance. Confidence in compliance is based not just on being able to detect violations in time for States parties to take appropriate action, but also on confidence that verification provisions are so well designed that they will help prevent cheating from taking place.

25. While nations enter into arms limitation and disarmament agreements as an expression of their sovereign rights and in anticipation of benefits to be derived, some States parties might come to the conclusion that an agreement places them at an unfair disadvantage, in part because some parties are not complying fairly and fully with agreed obligations. Questions over non-compliance on marginal issues may also lead to deeper concerns over non-compliance on more central security issues. If parties to an agreement come to believe, over time, that an agreement's provisions are no longer in their national security interest, concerns by others will arise over potential non-compliance.

2. Assessing implementation

26. A primary function of verification is assessing the day-to-day pattern of implementation of an agreement's provisions. Monitoring capabilities must be sufficiently adequate and effective to provide assurance that nations are faithfully and fully carrying out their obligations. Explicit provisions for doing so vary from the Antarctic Treaty, where signatories have the right to designate observers to carry out inspections with complete freedom of access, to the Partial Test Ban Treaty, which has no specific verification provisions.

27. Over time, monitoring techniques have improved considerably and have become more widely available. In addition, many new co-operative verification provisions have been agreed to, including detailed inspection provisions for both multilateral and bilateral agreements. These approaches, methods, procedures and techniques, which are discussed below, provide signatories with many tools to assess day-to-day implementation of arms limitation and disarmament agreements. Moreover, additions to this verification "tool box" can be expected in the future.

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3. Generating confidence

28. Verification arrangements must serve another function by generating confidence rather than distrust within participating States that others are fulfilling their obligations under an agreement. An important element for building confidence is the ability to collect information relative to the agreement in question sufficient to assess the compliance practices of other States. Confidence can also be built when verification provisions allow others to demonstrate clearly their commitment to compliance. For both of these reasons, provisions prohibiting deliberate concealment relative to an agreement's provisions and expressly permitting monitoring by national technical means and by co-operative measures have become widely used components of new accords.

29. Trust between States could be eroded if verification provisions are abused or misused - or if States come to believe so - in order to gather information not required to assess compliance with obligations under existing agreements. Under these circumstances, resentment rather than confidence could be generated, making a long-term process of arms limitation and disarmamant difficult to sustain. For this reason, it is important to avoid misuse of verification.

30. As in the case of discouraging non-compliance yet allowing appropriate monitoring for treaty implementation, a balance must be struck that allows sufficient transparency to build confidence in compliance, yet protects national security-related information that has no direct bearing on obligations undertaken by participating States. This balance will vary from one agreement to the next, depending on the scope and specific nature of the accord, and the degree of trust or distrust existing between parties to each agreement.

4. Dealing with uncertainties

31. Yet another function of verification is to provide procedures for dealing with uncertainties associated with implementation and compliance. States parties need such procedures because no agreement, regardless of the specificity and intrusiveness of its terms, can anticipate every conceivable eventuality. Nor can verification provisions completely prevent "false alarms". If agreements are worth while, they will remain in effect long after they are signed, even when new conditions arise that were not anticipated fully by the negotiators.

32. Verification provisions can help minimize uncertainties and false alarms associated with compliance, and the possibility of increasing distrust arising from such uncertainties, by providing for data exchanges, greater transparency between participating States through enhanced verification measures and a wide range of co-operative arrangements designed to alleviate concerns over non-compliance. Collateral constraints may also be agreed upon that elaborate treaty provisions or that apply to weapons systems not directly covered by an agreement, but that none the less build confidence in compliance. Consultative procedures are of special importance to solve questions of treaty compliance in a co-operative manner.

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33. Agreed verification procedures have been used to help defuse crises that could lead to conflicts that all parties wished to avoid. These efforts have been outside the scope of arms limitation and disarmament agreements, yet the techniques involved may prove to be suitable for future arms limitation and disarmament efforts. In sensitive areas of the globe, crisis prevention and resolution mechanisms are essential if these efforts are to succeed over time. In such regions, military exercises can be a special cause of concern, creating fears of a surprise attack and generating alerts and other compensating actions that can exacerbate an already tense situation. In such cases, agreed monitoring arrangements between the parties have been employed to alleviate concerns over military intentions or to monitor the mutual removal of troops from sensitive areas, helping to prevent armed conflict and loss of life. In this regard, extremely important work has been done and useful experience has been gained in the context of United Nations peace-keeping operations. Agreed verification procedures have been carried out by the parties themselves, with or without the assistance of third countries, by the United Nations, its affiliated operations or other multilateral efforts.

34. Another function of verification procedures is to provide confidence in compliance with disengagement agreements between parties that have been in conflict and wish to improve relations. As such, disengagement agreements can serve as important steps leading to the resolution of more central points of contention, permitting more significant steps towards improved relations, including arms limitation and disarmament agreements. As with crisis prevention and resolution mechanisms discussed above, verification provisions for disengagement agreements could be carried out by the parties themselves, with or without the help of third parties, and by the United Nations, its affiliated operations or other multilateral efforts.

5. Discouraging non-compliance

35. Agreed verification provisions can create confidence in compliance by discouraging non-compliance. Guaranteed inspection rights at production sites most suitable for prohibited activities are particularly helpful in this regard, forcing nations contemplating non-compliant behaviour and wishing to avoid detection to carry out such activity in new locations, requiring added investments and new patterns of military activities that leave many telltale signs for those monitoring compliance.

36. Highly intrusive verification measures can also provide timely warning. They require a great deal of co-operation between the parties. Existing patterns of co-operation might have to be altered in order to protect troubling preparations or non-compliant activities from being detected. For example, routine inspections at short notice or inspections of suspect sites may be denied, raising concerns over non-compliance and triggering more intensive monitoring efforts.

37. Well-designed verification provisions can also discourage non-compliance in instances where the party contemplating non-compliant behaviour can be swayed by political costs and by international public opinion. For these circumstances to be

met, the party contemplating non-compliance must have clear knowledge that existing verification provisions will produce evidence that can be used in public as well as in diplomatic forums, evidence that will be readily understandable and convincing.

38. Verification provisions must, in general, be proportional to the obligations undertaken. A balance must be struck between the effort needed to discourage non-compliance, by attempting to ensure detection, and the verification measures necessary to carry out the provisions of an agreement without producing an excessive number of false alarms. In addition, over-intrusive verification measures can become an impediment to improved relations. The standard set for verification of specific agreements is not immutable and may vary, depending on the nature of the agreement.

6. Timely warning

39. Well-designed verification provisions can help prevent non-compliance by providing a timely warning of potential compliance problems. In such circumstances, other States wishing to uphold the agreement in question can consult, make representations to the country or countries contemplating prohibited activities, and clarify the benefits of remaining in compliance or the penalties associated with non-compliant activities.

40. Provisions for intrusive verification, when called for, provide for timely warning in many ways. By providing timely access to sensitive military installations, as well as facilities and areas where activities of most concern are likely to take place, intrusive verification can make surreptitious non-compliance more difficult, expensive, time-consuming, or obvious. If verification provisions raise the financial, opportunity, and political costs of non-compliance high enough, they could discourage non-compliance. Properly devised challenge inspections can be particularly helpful in this regard.

41. All the functions of verification reviewed above serve to create the necessary confidence that agreements are being properly observed by all parties, a pre-condition to a successful, long-term process of arms limitation and disarmament.

42. It is also generally understood that verification measures cannot provide complete certainty in evaluating compliance or non-compliance. Inevitably, some provisions of an agreement will be easier to monitor with high confidence than others. Even if abundant monitoring capabilities were widely available and acceptable to States parties, the terms of an agreement may not lend themselves to certain judgements with respect to compliance. In those cases States parties to an agreement accept that the benefits of the agreement outweigh such difficulties.

D. Dynamics of the process of verification

43. The various phases of the verification process are often interactive and it is not always possible to distinguish clearly between them. It is, however, useful to identify three major elements (although they are not necessarily exhaustive):

(a) Collection of relevant information, which includes monitoring the behaviour of other countries relative to their obligations under arms limitation and disarmament agreements;

(b) Analysis of information collected;

(c) Reaching a judgement, on the basis of that information, about whether or not obligations under an agreement are being met. Once a determination is made that a violation has been committed, deciding what to do about it (i.e., "enforcement") is not part of the verification process.

44. Special expertise is necessary to operate information-gathering devices and to process and analyse the data they provide. Nonetheless, a great deal of useful information concerning compliance can also be obtained through far less sophisticated methods. For example, trained observers of military activities and skilled interpreters of pictures taken by aircraft can be especially important in monitoring multilateral agreements governing troop exercises or troop withdrawals.

45. The initial steps in the process of monitoring the activities of parties to an agreement as they relate to obligations undertaken in multilateral or bilateral agreements are dominated by technical and operational considerations. Experts involved in this stage of the process as a rule are not asked and do not seek to make judgements of compliance or non-compliance on the basis of the data they are collecting and analysing. Judgements with respect to compliance or non-compliance can have considerable political significance, and are thus the normal province of political officials rather than technical experts.

46. Only in the final stages of the verification process do political officials render judgements on the compliance practices of other States parties to agreements, utilizing the data, examination and analysis provided by technical experts. Declarations of non-compliance do not end the process, however. Instead, they can lead to further discussion with other States parties, the provision of additional data or institution of new co-operative arrangements to resolve compliance concerns. Alternatively, concerns over non-compliance may remain unresolved.

47. Numerous sources of data are examined and analysed during the verification process, including data provided by States parties in fulfilment of their obligations under the agreement. Indeed, as negotiated agreements have become more and more complex, the provision and gathering of data has become a sine qua non for the verification process and for the proper implementation of agreements.

48. New provisions, measures and practices for data exchanges have emerged for multilateral and bilateral agreements, for example, with the conclusion of the "Stockholm Document" by the Conference on Confidence- and Security-building Measures and Disarmament in Europe, and the INF Treaty. As a result of both agreements, unprecedented amounts of data, whether on military exercises or force deployments and infrastructure, are now routinely exchanged between participating States. These co-operative data exchanges could also be supplemented by unilateral methods of gathering data, permitting States to assess proper implementation of arms limitation and disarmament agreements.

49. The unilateral provision and co-operative exchange of data, even when not required by specific agreements, can also be helpful. The extension of this practice can promote confidence and security, and lay the ground work for subsequent arms limitation and disarmament agreements. Examples of such voluntary measures are the submission of data regarding national military expenditures by States Members of the United Nations to the Secretary-General and international experiments for the exchange of seismic data in the framework of the Conference on Disarmament.

50. An important example of additional data gathering has been the Secretary-General's fact-finding missions to investigate allegations of the use of chemical weapons in contravention of the 1925 Geneva Protocol. Such activities, although not verification procedures as part of an existing arms limitation and disarmament agreement, have been a practical illustration of the international community's demand to determine whether or not a specific convention is being observed.

51. In order to generate confidence in disarmament agreements and to make the process of arms limitation and disarmament sustainable, it is important to focus data collection solely on activities related to the specific obligations to be verified. With the consent of parties involved, this can be done in a number of ways, including:

(a) Determining the access to locations for data collection, e.g., limiting flight paths of aircraft and confining OSIs to specific areas determined in the relevant agreements;

(b) Restricting the categories of sensors that may be used, e.g., allowing only certain types of sensors on aircraft;

(c) Designating specific sensor characteristics, e.g. specifying sensors in order to restrict powers of resolution;

(d) Developing appropriate procedures with a view to protecting sensitive information.

52. Information gathered by national technical means (NTM), data exchanges, and other measures agreed to by States parties to arms limitation and disarmament agreements are then analysed by experts. Their reports are then processed at the policy level. Ambiguous events or troubling activities or practices that raise questions concerning non-compliance will lead to additional data gathering and further analysis by technical experts. Data gathering and diplomatic initiatives may ameliorate concerns and resolve the issue in a satisfactory way, instead of leading to protracted impasses.

E. Bilateral/multilateral dimensions

53. Bilateral negotiations and agreements between the United States and the Soviet Union continue to be of the utmost importance, as the States parties build on the progress achieved in the INF Treaty. When significant reductions in strategic arms

are realized, it is widely recognized that such reductions will demand stringent bilateral measures of verification.

54. Constructive interaction between bilateral and multilateral efforts has already established more favourable conditions for progress in arms limitation and disarmament.

55. While bilateral efforts remain, by definition, bilateral in character, they may also involve other countries, as is evident from the INF Treaty. Although a bilateral agreement, it necessarily involves third parties that have consented to base the weapons systems being eliminated and host foreign inspection teams. The Treaty also utilizes the same concept of registers of experts to serve as inspectors that the International Atomic Energy Agency (IAEA) has long employed to advantage. The same arrangement is now available to the Secretary-General in carrying out investigations of alleged use of chemical weapons.

56. As new agreements are negotiated, States parties can apply experience gained in the past to new accords. Thorough data exchanges have become common to both types of negotiations, including the concept of exchanging data during negotiations, after ratification (when applicable), as well as during the implementation period. Since the inception of the United Nations, one of the early instances in which the concept of on-site inspections was agreed upon in the multilateral context was the Antarctic Treaty. Short notice inspections without a right of refusal were first agreed upon in a multilateral forum (the Stockholm Document) and then adopted shortly thereafter in the INF Treaty. While verification provisions will necessarily be keyed to the specific (and sometimes unique) requirements of an agreement, these examples suggest that the growing similarity of verification techniques for multilateral and bilateral accords will help both kinds of negotiations in the future.

57. Adequate and effective verification measures are no less important for multilateral agreements than for bilateral accords. Indeed, in some respects, verification arrangements are even more critical in a multilateral context, where new complexities can be added in the negotiation of new accords. Monitoring arrangements of multilateral accords must also effectively bridge the diverse verification capabilities of individual States parties.

58. Multilateral accords require intense co-operation between the States parties for agreements to be implemented effectively. Appropriate consultative arrangements and concerted efforts to resolve compliance questions expeditiously and effectively might be incorporated where necessary into multilateral as well as bilateral accords. Multilateral agreements that include many parties may require verification arrangements that address a broad range of different conditions. At the same time, multilateral verification arrangements may offer organizational economies and efficiencies as the number of parties to an agreement grows.

59. To date, bilateral and multilateral agreements have produced various institutional mechanisms to implement the accords and to handle compliance questions. Specified verification procedures, both bilateral and multilateral, vary according to the scope and purposes of individual accords, as well as the

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degree of intrusive verification that States parties are willing to accept. The United Nations system supports and facilitates these efforts in several ways, as detailed in section IV below. Ways in which new types of assistance might be rendered are discussed in section V below.

F. Legal aspects

60. One of the fundamental principles of international law is that of respect by each sovereign State for the territorial integrity and political independence of other States. States have the sovereign right to enter into arms limitation and disarmament agreements, and in doing so, permit verification of obligations undertaken therein. The exercise of verification must be based on the principles of international law.

61. When States fulfil constitutional processes to become parties to arms limitation and disarmament agreements, under international law they are obligated to take measures necessary for the proper implementation of provisions negotiated and agreed to in good faith. The Latin phrase, *pacta sunt servanda*, embodies this principle: every treaty in force is binding upon the parties and must faithfully be performed by them. The preamble to the Vienna Convention of the Law of Treaties specifically notes that "the principles of free consent and of good faith and the *pacta sunt servanda* rule are universally recognized".

62. The principle of *pacta sunt servanda* is closely associated with verification provisions of a treaty. According to the Vienna Convention of the Law of Treaties, "a material breach of a bilateral or multilateral treaty entitles the other party or parties to invoke the breach as a ground for terminating the treaty or suspending its operations in whole or in part". Accurate forms of verification are therefore necessary to determine compliance with treaty provisions and the continued viability of the principle of *pacta sunt servanda*.

63. Credible means of verification are furthermore of fundamental importance when one or several parties to a treaty seek to invoke the principle of *rebus sic stantibus*, i.e., a fundamental change of the circumstances prevailing at the time of the treaty's conception which would render it invalid. The termination of, or withdrawal from a treaty owing to a fundamental change of circumstances should not be exclusively a matter of political judgement. Appropriate verification measures may prevent the misuse of the *rebus sic stantibus* principle by providing all parties to a treaty with means to establish whether a fundamental change in circumstances has actually taken place.

64. In some cases, implementing legislation might be required to conform domestic law with international obligations newly undertaken.

65. Though nothing in current international law is opposed to the monitoring for verification purposes from space, a specific mandate would be necessary to charge an international organization such as the United Nations with this responsibility. Treaties may also provide specific authority to States or organizations for monitoring elsewhere in areas under national sovereignty, e.g., in territorial

waters, in the atmosphere or on the ground, for the purpose of monitoring arms limitation and disarmament agreements. The acceptance of on-site inspections, the utilization of foreign monitoring devices, as well as the obligation not to interfere with or impede verification measures for treaty obligations constitute procedures essential to determining whether treaty obligations are being faithfully and fairly implemented. These verification measures, like all others, must be pursued in a manner consistent with generally recognized principles of international law. Increased openness and transparency within and between States can also encourage strict compliance with obligations under arms limitation and disarmament agreements.

66. The progressive development of international law can be helpful in this regard. Under Article 13 of the Charter of the United Nations, the General Assembly may initiate studies and make recommendations for the purpose of encouraging the progressive development of international law and its codification. In addressing the issue of compliance with arms limitation and disarmament agreements, on 15 December 1989, the General Assembly adopted resolution 44/122, which expressed the profound concern of all Member States for maintaining respect for rights and obligations arising from treaties and other sources of international law.

67. The role of the United Nations in the area of arms limitation and disarmament verification is contingent upon the request and the explicit consent of the States parties to an arms limitation and disarmament agreement, as stated in principle 13 of the Disarmament Commission's principles of verification (see para. 23 above) endorsed by the General Assembly.

G. Verification and treaty specificity

68. Arms limitation and disarmament verification is agreement-specific and is the responsibility of States parties to such agreements, unless they explicitly consent to the involvement of other States or organizations in the verification process. Monitoring and data collection are not necessarily treaty-specific. In specific cases, monitoring and data collection efforts, such as peace-keeping, crisis management, or fact-finding by the Secretary-General of the United Nations, can provide useful lessons that might be of value to the verification of future arms limitation and disarmament agreements.

69. As noted above, there is a growing similarity of verification procedures and techniques for both bilateral and multilateral agreements. For example, data exchanges, co-operative measures, on-site inspections, and registers of experts to monitor implementation and investigate concerns over non-compliance are generally applicable regardless of the number of parties to an agreement. At the same time, it is generally understood that verification procedures and techniques can be somewhat different from one agreement to the next, depending on the specific objects and purposes of each accord and the number of parties involved. Other techniques and means may be multi-purpose in nature.

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70. The process of the Conference on Security and Co-operation in Europe (CSCE) has generated considerable thought about various kinds of confidence- and security-building measures (CSBMs), some of which have already been put into practice. Over time, partial and voluntary measures have been expanded and made compulsory, to the benefit of all parties to these accords. The implementation of similar procedures, especially with respect to the provision of annual calendars of military exercises and the exchange of observers under certain conditions, could help defuse tensions in other areas and pave the way for formal accords. In this way, lessons drawn from verification arrangements devised for specific accords may be useful in other agreements.

71. As discussed in section IV below, the United Nations system has specific responsibilities in the area of arms limitation and disarmament under existing accords. But the United Nations can also facilitate and co-ordinate efforts to promote future arms limitation and disarmament agreements. Data exchanges, co-operative measures and on-site visits by experts need not necessarily be tied to specific agreements in order to be of value. They can also ease concerns over national security, build confidence about non-threatening intentions of neighbouring or distant States, and help lay the groundwork for new accords with enhanced verification measures.

72. The application of these generic functions is, for the most part, not treaty-specific at present; they may or may not become more treaty-specific in the future. In either event, the objective of these activities is not to interfere with existing agreements or ongoing negotiations, but to facilitate them.

Notes

1/ General Assembly resolution S-10/2.

2/ See Official Records of the General Assembly, Fifteenth Special Session, Supplement No. 3 (A/S-15/3), para. 60.

III. VERIFICATION APPROACHES, METHODS, PROCEDURES AND TECHNIQUES

A. Descriptive survey

1. National technical means

73. "National technical means" (NTM) are devices under the control of a State party that can be used for monitoring at a distance compliance with arms limitation and disarmament agreements. NTM include observation satellites, aircraft-based systems, such as radars and cameras, as well as sea- and ground-based systems. The important role of NTM is acknowledged in arms limitation and disarmament agreements that include obligations not to interfere with these devices.

74. Monitoring methods by national technical means capable of collecting relevant data at long ranges are an essential component of verifying many arms limitation and disarmament agreements. These methods do not disrupt activities within the State being monitored nor do they require a physical presence within that State. When appropriate, and for great effectiveness, States might agree to co-operate by avoiding the use of camouflage and other types of deliberate deception, by refraining from jamming or blinding monitoring devices, or by refraining from the encryption of telemetry or from transmitting it in ways that foil its reception by others.

75. Disparities in observation capabilities have been a cause of concern for some, especially in the context of multilateral negotiations. This concern, as well as a broader interest in providing the international community with information relating to issues of common security, has led some States to advocate the use of observation satellites as a central component for an international verification mechanism. In the future, verification systems that are currently under national control could involve the participation of several States, or new "Multi-national technical means", such as imaging or telecommunications satellites, could be developed.

76. Observation satellites have proven to be instrumental in bilateral accords between the Soviet Union and the United States. These satellites have made it easier for arms limitation agreements to be negotiated and implemented during periods when co-operative verification arrangements were minimal. Observation satellites continue to be essential in times when wide-ranging co-operative measures are in place, as they provide an important basis for assessing compliance, including the faithful implementation of co-operative arrangements. While a growing number of countries currently operate observation satellites or will do so in the near term, only two - the United States and the Soviet Union - are now in a position to acquire data from high resolution observation satellites.

77. As monitoring tools, satellites, though they have their limitations, provide broad coverage over areas of concern, and provide analysts with an important tool to detect changes over time, on the ground, that may be of military significance. Satellite coverage has been particularly useful for monitoring large objects, such

as naval combatants, bombers, and most types of strategic weapons launchers, as well as military installations. The smaller and more mobile the object, the harder it is to observe from space and the more other methods of coverage become necessary. Discussion of the advantages and disadvantages of international satellite monitoring is found in section V, below.

78. States possessing satellites with sensors to detect nuclear explosions in the atmosphere and outer space have found them to be useful in monitoring compliance with the Partial Test Ban Treaty and the Treaty on the Non-Proliferation of Nuclear Weapons. Satellites can also provide important information that, while not directly linked to arms limitation and disarmament accords, help lay the groundwork for them by providing continuing assurance of non-hostile intent and timely warning of concerns that may require urgent consultations.

79. The diffusion of observation satellite technology and launch capabilities has created new opportunities for additional States to monitor crises and arms limitation and disarmament agreements. The launch of SPOT I by a French, Belgian, and Swedish consortium in 1986 is particularly noteworthy in this regard, as it provided for the first time an ability to detect objects at least 10 metres across ("10-metre imagery") on a commercial basis. Subsequently, the Soviet Union announced the availability for sale of five-metre imagery, and the United States announced a new policy permitting its firms to sell imagery comparable to that available elsewhere. Other States, such as China, India and Japan, currently operate earth-observation satellites; they will launch new satellites with improved capabilities over time, and other Member States will undoubtedly follow suit.

80. States that do not at present operate satellites may unilaterally employ manned aircraft or camera-carrying remotely piloted vehicles (RPVs) to collect data. The technology utilized by these more modest monitoring tools is far less sensitive and expensive than for satellites. They are also inherently more flexible to the tactical requirements of those monitoring various types of agreements: unlike satellites, the ground tracks of aircraft are not predictable and they can be more easily redirected to an area of interest.

81. Many States possess another kind of NTM: seismic stations that provide data concerning underground explosions. Properly equipped and operated, stations can detect very distant seismic events. It is widely considered that the effectiveness of these stations has grown significantly with new configurations, especially the use of national arrays. States that have participated in co-operative arrangements to improve seismic monitoring capabilities have found them useful. An example of such arrangements is the large-scale experiments being carried out as part of the work of the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and to Identify Seismic Events (described in sect. IV).

82. Other types of NTM include aircraft- and ship-borne sensors, ground-based radars and listening stations, as well as satellites. Taken together, these NTM can provide a composite picture of events on the ground, providing experts with large amounts of data concerning compliance.

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2. Co-operative measures

83. In addition to data generated by technical devices under national control and data exchanged by States parties to arms limitation and disarmament agreements, the verification process is facilitated by co-operative measures that simplify the collection of evidence, whether from the ground, air, or space.

84. Even though NTM have become increasingly sophisticated, co-operative measures have grown in importance for both multilateral and bilateral accords. The complexity of current and prospective negotiations, together with the small size, mobility or dual purpose nature of many of the weapons systems and military capabilities negotiators seek to prohibit, limit or reduce, have progressively demanded co-operative approaches.

85. The forms such co-operative arrangements have taken are quite varied, as is to be expected for agreements that undertake substantially different tasks. Co-operative arrangements could include, but are not limited to, designing weapons systems and their deployment modes in ways that simplify verification; permitting aircraft overflights to observe military-related installations and activities; pre-notifying certain weapons tests to allow others to monitor them more effectively; conducting joint verification experiments to assist monitoring efforts; arranging for foreign representatives to observe or inspect, with an appropriate degree of intrusiveness and timeliness, installations or activities; and non-interference with NTM. As negotiated agreements become increasingly complex, the need for co-operative measures will grow. As the list of co-operative measures grows, so, too, will their applicability to new accords and efforts that facilitate subsequent arms limitation and disarmament agreements.

86. The provision and exchange of data can be an extremely important co-operative measure: it can build confidence and increase transparency. It can also lay the groundwork for more intrusive measures of co-operation, especially on-site inspections (OSIs).

87. National systems for control which provide a basis for the implementation of arms limitation and disarmament inside the respective countries are a special kind of national measure in the field of verification. National systems of accounting for and control of nuclear materials are, e.g., part of the IAEA-safeguards system. Under a future convention on chemical weapons, States parties may be required to designate or establish national authorities to implement treaty obligations. These authorities would have, *inter alia*, such tasks as data collection and reporting to the international organization established by the convention, and providing assistance for international on-site inspections in the respective country.

88. Other forms of co-operative measures allow for *in situ* monitoring devices of various kinds, whether static or mobile. Sensors could be employed to cover a wider range of production facilities, weapons deployment areas, secured storage and destruction facilities. A wide variety of sensors could also be utilized for various confidence- and security-building measures in concert with substantive measures of arms limitation and disarmament, in particular in the fields of armed

forces and conventional armaments. In specific cases, tagging techniques for military equipment could be of use.

89. On-site inspections are intrusive co-operative measures. OSIs require close co-operation to work properly, both by the host country and by the inspectors. Detailed procedures should be worked out in advance to clarify the rights and obligations of the inspectors as well as their hosts, although some flexibility is warranted to allow for the clarification of questions on site. OSIs can be very important for verifying compliance and for building confidence in the arms limitation and disarmament process; on the other hand, one must recognize that OSIs have certain limitations. For the promise of OSIs to be met, great care and commitment by all parties to an agreement are required to make the inspection process serve its intended purposes.

90. An important breakthrough in OSI was achieved in the Stockholm Document, wherein the parties agreed to mandatory inspections without a right of refusal under certain conditions. This accord also expressly allows observers to be present at military exercises when the number of troops engaged meets or exceeds certain thresholds. The participating States have stated that they are encouraged by the initial implementation of the measures adopted in the Stockholm Document.

91. OSIs can take many different forms. They can be systematic or ad hoc. For example, in the INF Treaty, five different types of inspections were agreed upon: baseline inspections to help verify the initial exchange of data; close-out inspections to confirm that treaty-prohibited activities have ceased; elimination inspections to observe the destruction of treaty-limited items; short-notice inspections without right of refusal at agreed facilities; and continuous portal monitoring at selected production facilities. Routine inspections of industrial enterprises are being elaborated in the negotiations taking place regarding a chemical weapons convention.

92. In a joint statement issued on 1 June 1990 by the President of the Union of Soviet Socialist Republics and by the President of the United States of America, the verification provisions for a treaty on the reduction and limitation of strategic offensive arms were described as including:

(a) "On-site inspections: for the purpose of ensuring verification of compliance with the Treaty, each side will, on the basis of reciprocity, conduct 12 kinds of on-site inspections, as well as continuous monitoring of mobile ICBM production facilities, in accordance with agreed procedures. Inter alia, each side will conduct short-notice inspections at facilities related to strategic offensive arms, including inspections to verify the numbers of re-entry vehicles on deployed ballistic missiles, inspections to verify elimination of strategic offensive arms and facilities related to them, suspect site inspections, and various exhibitions;

(b) "National technical means of verification: for the purpose of ensuring verification, each side will use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law. The Treaty will include a series of co-operative measures to

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enhance the effectiveness of national technical means of verification. There will be a ban on interference with such means;

(c) "Ban on denial of telemetric information: the sides agreed to make on-board technical measurements on ICBMs and SLBMS and to broadcast all telemetric information obtained from such measurements. Except for strictly limited exemptions, there will be a ban on any practice, including the use of encryption, encapsulation or jamming, that denies full access to telemetric information;

(d) "Information exchange: before signature of the Treaty the sides will exchange data on the numbers, locations and technical characteristics of their strategic offensive arms. These data will be updated on a regular basis throughout the lifetime of the Treaty;

(e) "A comprehensive agreement on the manner of deployment of mobile ICBM launchers and their associated missiles and appropriate limitations on their movements so as to ensure effective verification of adherence to the numerical limitations provided for in the Treaty. In addition, the number of non-deployed ICBMs for mobile launchers will be limited and mobile ICBMs will be subject to identification through the application of unique identifiers, or tags.

"To promote the objectives of the Treaty, the sides will establish the Joint Compliance and Inspection Commission."

93. Other types of inspections may be developed when new agreements are concluded. For example, manned control posts have long been considered in the context of multilateral conventional arms reductions and they have proven useful for the implementation of cease-fire, disengagement, and other agreements by United Nations peace-keeping forces; provisions for challenge inspections at suspect sites are under consideration in both multilateral and bilateral negotiations; and concepts for zonal inspections have also been advanced.

94. A valuable supplement to compulsory and intrusive OSIs can be found in voluntarily inviting qualified observers to visit, within a sufficient period of time and with an appropriate degree of intrusiveness, relevant facilities or areas where questions concerning compliance or troubling military activities have taken place. Invitational inspections can also help participating States gain a better understanding of improved verification procedures for existing or new agreements. Prominent examples of such invitations include site visits to chemical weapons-related facilities in the United States and the Soviet Union, and invitations to visit radar facilities in the Soviet Union.

95. A multilateral system which incorporates several of the aspects described above is the safeguards arrangements carried out by IAEA. Involving co-operative agreements between individual States and IAEA, the collection of data by IAEA, a system of on-site inspections using modern technology and inspectors from many countries, the safeguards system is widely regarded as having been highly successful. More details of the IAEA safeguards arrangements are given in section IV.

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96. Mutually agreed consultative provisions can provide States with procedures for dealing with ambiguities and uncertainties over compliance that will naturally arise during the implementation process. Consultative provisions can provide a forum for the private exchange of additional data clarifying existing practices bearing on compliance. Consultative bodies can also permit States to devise new common understandings for unforeseen developments or to develop more precise guidelines for permitted activities.

97. Multilateral procedures for dealing with disputes over non-compliance in a number of past agreements have included seeking the assistance of the Secretary-General, lodging complaints with the Security Council, holding review conferences to consider ways to strengthen existing agreements, and referring unresolved issues to the International Court of Justice. In addition, the South Pacific Nuclear-Free Zone Treaty (Treaty of Rarotonga) establishes a multilateral consultative committee to which compliance questions relating to the establishment of a nuclear-free zone in the South Pacific may be addressed.

98. Consultative procedures have been developed in considerable detail in bilateral agreements between the Soviet Union and the United States. The Standing Consultative Commission (SCC) was established in the SALT I Interim Agreement and the Anti-Ballistic Missile (ABM) Treaty, with jurisdiction over the Accident Measures Agreement, as well. Subsequently, its jurisdiction was expanded with the Protocol to the ABM Treaty and the unratified SALT II Treaty. A second bilateral consultative body, the Special Verification Commission (SVC), was established to address implementation and compliance questions associated with the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (the INF Treaty).

99. This descriptive survey of verification or verification-related approaches, methods, procedures and techniques is far from exhaustive; new ideas for verification are being generated in ongoing conferences and negotiations and in analyses by governmental and non-governmental experts. In addition, consultative arrangements are being refined, while new monitoring tools, techniques and approaches with multi-purpose applications can provide important lessons for future arms limitation and disarmament agreements. The fact that many choices for securing adequate and effective verification are available to negotiators augurs well for the future. While difficult negotiating problems must be overcome, there is an unprecedented array of monitoring tools and techniques to apply to the tasks at hand.

B. Interaction and co-ordination

100. No single verification tool is likely to be sufficient for any accord; adequate and effective verification arrangements will require the synergistic and overlapping application of numerous approaches and devices, such as those described above. For example, questions arising from information gathered by satellites can be addressed by on-site inspections. Continuity is an essential component of successful verification approaches and methods.

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101. The importance of impartial, professional analysis is underscored by the potential costs of misinterpreting data: detection of significant compliance problems may be missed, or a State may be unfairly charged with non-compliance. Building up an infrastructure of highly trained professionals to collect and analyse data is just as important as having technical devices in place for those purposes. Therefore, highly trained experts are required to analyse the data properly, it being understood that these experts will provide their services in an impartial way, divorced from personal, national, or political biases.

102. Together with the verification tools and professional experts required to analyse the data, it is essential to be able to utilize necessary information in a timely manner. For some techniques, such as on-site inspections, this means a requirement for quick access to the area of interest; for some technical devices, such as satellites, this may mean a requirement for multiple platforms.

103. Adaptability is also an essential component of verification approaches and methods. Devices for verifying compliance can perform more than one monitoring task and they can be utilized for new tasks that are assigned. For example, an optical imaging satellite can be utilized for many different kinds of arms limitation and disarmament agreements as well as for efforts to defuse crises. A satellite having multiple sensors can be more useful than one having a single sensor requiring daylight viewing and minimal cloud cover. The larger the number of capabilities inherent in devices to verify compliance, the more adaptable (and expensive) they will be. Difficult choices are therefore unavoidable between cost and adaptability.

104. Data exchanges and monitoring efforts by States or organizations that are not parties to existing agreements can have an interactive role with arms limitation and disarmament efforts. Increased transparency that reduces concerns over military activities may encourage new States to enter into arms limitation and disarmament agreements, and co-operative arrangements between States based on consultative procedures can have similar effects. Fact-finding missions undertaken by the Secretary-General are necessarily based on and contribute to information derived from other sources.

IV. EXISTING ACTIVITIES OF THE UNITED NATIONS IN VERIFICATION

A. Introduction

105. The United Nations has had a longstanding interest and concern over compliance with provisions of international agreements and treaties, dating back to the adoption of the first resolution by the General Assembly (1 (I) of 24 January 1946), which established the Atomic Energy Commission. In recent years, the question of verification, as an essential element in the process of achieving arms limitation and disarmament agreements, has attracted increased attention.

B. Development of general principles and other initiatives within the United Nations

1. Consideration by the General Assembly and studies carried out by the Secretary-General

106. In 1978, the holding of the tenth special session of the General Assembly, the first special session devoted to disarmament, provided an opportunity for a closer look into the question of verification. Not only was verification the subject of several proposals discussed at the special session, but it was also given specific attention in the Final Document 1/ adopted at that session.

107. Proposals submitted by Governments addressed issues ranging from the establishment, in one form or another, of an international disarmament organization as the operational framework for the implementation of international arms limitation and disarmament treaties, with functions mainly in the field of verification (Netherlands (A/AC.187/108); Sri Lanka (A/S-10/AC.1/9)), to the creation of an international satellite monitoring agency which would participate in monitoring the implementation of international disarmament and security agreements and in the investigation of specific situations (France (A/S-10/AC.1/7)); and from recommendations on the seismological verification of a comprehensive nuclear-test ban (Federal Republic of Germany (A/S-10/AC.1/12)), to a request that the Secretary-General conduct a study on all aspects of verification and control of arms limitation and disarmament measures (Austria (A/AC.187/101)). Of these, the French proposal for the establishment of an international satellite monitoring agency was later the subject of a study carried out by the Secretary-General ((A/AC.206/14) of 1982). The study was submitted to the twelfth special session of the General Assembly, the second special session devoted to disarmament, held in 1982.

108. During the twelfth special session, the General Assembly considered several proposals regarding verification made by Member States. The majority of those proposals addressed, though in varying ways, the concept of establishing an international body entrusted with the verification of implementation of arms limitation and disarmament agreements. Discussions were inconclusive, including those in connection with the report of the Secretary-General on the question of the establishment of an international satellite monitoring agency. A year later, the

Secretary-General submitted a further report on the subject, this time addressing, as requested by the Assembly, the practical modalities for implementing the institutional aspects of an international satellite monitoring agency (A/38/404). The Secretary-General's report noted that, as recommended by the experts participating in the original study, the creation of such an agency would have to follow the same legal framework as for other international intergovernmental organizations. A treaty or convention among participating States should therefore be the appropriate process for the establishment of the agency and it would be up to the General Assembly to decide when it wished to initiate action to that end.

109. Other proposals have been made in this context. These have included, inter alia:

(a) In August 1987, at the International Conference on Disarmament and Development, Hungary proposed that consideration be given to establishing a disarmament agency to co-ordinate effective procedures for the international verification of compliance with disarmament agreements, to use available means and methods of monitoring disarmament and military activities subject to control, and to promote peaceful co-operation among States (statement of 27 August);

(b) In March 1988, the USSR presented at the Conference on Disarmament a detailed proposal on the establishment of an international system of verification of the non-deployment of weapons of any kind in outer space (CD/817-CD/OS/WP.19). In December 1988, the Soviet Union stressed the need to develop a comprehensive régime for peaceful activity in space and suggested that control over the observance of that régime be a prerogative of a proposed world space organization (A/43/PV.72);

(c) In July 1990, at the Conference on Disarmament, the German Democratic Republic proposed that consideration be given to establishing a centre for confidence-building and verification of arms limitation within the framework of the CSCE (CD/PV.561).

2. Consideration by the United Nations Disarmament Commission

110. Despite various efforts by States to bring the question of verification to the forefront of arms limitation and disarmament discussions in the international organization, it was not until 1985 that consideration of the question of verification was intensified within the framework of the United Nations. That year, at the initiative of Canada, a new resolution entitled "Verification in all its aspects" (40/152 O) was adopted by the General Assembly. While that initial resolution requested the Secretary-General for a report containing the views of member States on various aspects of verification, in addition, the resolutions adopted in the following two years called for the Disarmament Commission to consider the issue of verification in all its aspects.

111. The Disarmament Commission reaffirmed the continued relevance of the basic principles on verification identified in the Final Document of the Tenth Special Session of the General Assembly. 1/ Building upon them, the Commission developed

and adopted, in 1988, the list of 16 principles of verification set out in section II of the present report. In addition, the Commission reached agreement on a text on provisions and techniques of verification, and it also addressed the question of the role of the United Nations and its Member States in the field of verification.

112. In its report to the General Assembly, 2/ the Commission recognized among other things that adequate and effective verification involves the use of a combination of various verification methods, procedures and techniques in such a manner that they reinforce one another and that the choice of the appropriate combination varies with the scope and nature of the arms limitation and disarmament agreement. The Disarmament Commission also emphasized that provisions regarding procedures for consultation and co-operation can greatly assist in resolving problems emerging in the course of the implementation of arms limitation and disarmament agreements, and that they could involve such arrangements as bilateral consultations, the United Nations, and/or the use of organizations set up under the specific agreement in question.

113. On the question of the role of the United Nations and its Member States in the field of verification, the Disarmament Commission welcomed the view expressed by the Secretary-General in his 1987 report on the work of the Organization that the United Nations can make a significant contribution in the field of verification. Some of the proposals made under this topic, which though discussed were not agreed upon, included the establishment of a verification database within the United Nations; the development of a United Nations capacity to provide advice to negotiators respecting verification matters; research into the process, structures, procedures and techniques of verification as well as the role of the United Nations; and the establishment of an integrated multilateral verification system within the United Nations.

3. Consideration by the General Assembly at its fifteenth special session

114. Four proposals specifically relating to the role of the United Nations in the field of verification were formally submitted to the General Assembly at its fifteenth special session, the third special session devoted to disarmament, held in 1988.

115. Following up their initiative contained in the Stockholm Declaration of January 1988, the countries represented in the Six-Nation Initiative - Argentina, Greece, India, Mexico, Sweden and the United Republic of Tanzania - in a joint working paper (A/S-15/AC.1/1), called for the special session to endorse the principle of an integrated multilateral verification system within the United Nations as an integral part of a strengthened multilateral framework required to ensure peace and security during the process of disarmament as well as in a nuclear-weapon-free world. The sponsors further proposed that the special session should request the Secretary-General to prepare, with the help of qualified experts, an outline of such a system.

116. Canada and the Netherlands submitted a paper on verification and the United Nations, focusing on the constructive role which the United Nations could play in multilateral verification by functioning as an information clearing house and providing assistance and expertise in the area of verification (A/S-15/25). The main focus of this advisory and service function of the United Nations would be, according to the sponsors, to provide assistance to national negotiators and executors of arms limitation agreements. To that end, Canada and the Netherlands proposed an in-depth United Nations study which, they hoped, would advance international understanding of verification within the United Nations framework, and help to develop an appropriate role for the Organization in this field.

117. A proposal introduced by France (A/S-15/34) addressed the question of the role of the United Nations in contractual verification, investigation procedures and collection of space data. In connection with contractual verification, France proposed the establishment of a group of experts which, among other things, would study the relationship between verification and security, prepare an inventory of verification methods, techniques and procedures and reflect on the future role of the United Nations in the field of verification. In making this proposal, France indicated its readiness to combine it with that made by Canada and the Netherlands. Concrete proposals were also made regarding investigation procedures and collection of space data, including the establishment, within the United Nations, of an agency for the processing and interpretation of space images.

118. Bulgaria, Czechoslovakia and the Soviet Union submitted a working paper calling for the consideration of the establishment, under the auspices of the United Nations, of a mechanism for wide-ranging international verification of compliance with agreements aimed at reducing international tension and limiting armaments, and for monitoring the military situation in regions of conflict (A/S-15/AC.1/15). Some of the measures which the sponsors suggested for implementation as part of such a mechanism incorporated the establishment of a United Nations data base on disarmament and verification problems, as originally proposed by Finland; of an international space monitoring agency based on the concept put forward by France; and of machinery for the international verification of nuclear tests as suggested by the countries represented in the Six-Nation Initiative.

119. As agreement on these and other proposals was not reached during the special session, further action on the question of verification was left for the forty-third session of the General Assembly in 1988. Two separate draft resolutions on the subject were introduced in the First Committee of the General Assembly. The first draft, entitled "Verification in all its aspects" was initiated by Canada, France and the Netherlands. In recognizing that multilateral aspects of verification of arms limitation and disarmament agreements deserved further in-depth consideration, the draft requested the Secretary-General to undertake a study which would address the question of the role of the United Nations in this particular area and make recommendations to that end. A second draft, sponsored by the countries represented in the Six-Nation Initiative, addressed the subject of verification within the United Nations. By that draft, the General Assembly would endorse the principle of a multilateral verification system as proposed by the countries represented in the Six-Nation Initiative at the

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third special session of the General Assembly devoted to disarmament. It would also request the Secretary-General to undertake a study on the role of the United Nations in the field of verification of arms limitation and disarmament agreements, including preparations for an outline of a multilateral verification system within the Organization.

120. The General Assembly subsequently adopted a composite resolution, 43/81 B by which, *inter alia*, the Assembly requested the Secretary-General to conduct the present study.

C. Verification provisions under existing agreements

121. A number of arms limitation and disarmament agreements, as well as some disarmament-related agreements, include provisions referring to the United Nations or the Secretary-General, to specialized agencies, or to the International Court of Justice. In most cases, those provisions relate to a monitoring or co-operative role, as through certain types of exchange of information, and to the settlement of disputes regarding the interpretation or application of a given treaty, but not necessarily to the actual rendering of compliance judgements. Furthermore, it should be noted that, although such provisions do exist, they have for the most part not been activated. In the particular case of the Treaty on the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco), the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the South Pacific Nuclear-Free Zone Treaty (Treaty of Rarotonga), one feature that is common to them is the application of IAEA safeguards, among other measures, to the implementation of the provisions therein.

1. Relevant provisions regarding the United Nations and the International Court of Justice

122. The table below provides a summary of the verification provisions and compliance procedures of various agreements and indicates the instances in which a role is envisaged for the United Nations, including in connection with review conferences. It will be noted that the latter role, although based on treaty provisions, has normally been established through General Assembly resolutions regarding the relevant review conferences.

Table. Multilateral disarmament-related agreements: verification provisions and compliance procedures*

Name of agreements a/	Signed (1)	Entered into force (2)	Objective (3)	Specific verification provisions (4)	Verification methods (5)	Compliance procedures (6)	United Nations role (7)
A. Global multilateral agreements							
Geneva Protocol	1925	b/	Prohibit use in war of CB weapons	None	None	See col. (7)	Investigation of alleged use c/
Antarctic Treaty	1959	1961	Antarctica to be used for peaceful purposes only	Arts. III, VII	Exchange of information. General on-site inspection by designated observers. Aerial observation	Consultation (arts. VIII and XI). ICJ settlement (art. XI)	Development of co-operative working relations with United Nations specialized agencies having a scientific or technical interest in Antarctica (art. III, para. 2)
Partial Test Ban Treaty	1963	1963	Prohibit any nuclear-weapon test in atmosphere, outer space and under water	None	d/	None	
Outer Space Treaty	1967	1967	Protect common peaceful interest of all mankind in the exploration and use of outer space	Arts. X, XII	Observation of flights of space objects on a basis of equality. General on-site inspection with respect to the Moon and other celestial bodies, on a basis of reciprocity	Consultations (art. IX)	Parties to inform Secretary-General of their activities in outer space (art. XI)
Non-Proliferation Treaty	1968	1970	Prevent wider dissemination of nuclear weapons	Art. III	IAEA safeguards	See col. (5); also, review conferences (art. VIII, X)	Role in connection with review conferences
Sea-Bed Treaty	1971	1972	Prevent a nuclear-arms race on the sea-bed and the ocean floor	Art. III	Observation of activities on the sea-bed using own means, or with the assistance of any other party, or through international procedures	Consultations. Lodging of complaint with Security Council (art. III). Review conference (art. VII)	See col. (6). Also, role in connection with review conferences. In addition, Secretary-General to report on technological developments relevant to the Treaty and to the verification of compliance with the Treaty e/
Biological Weapons Convention	1972	1975	Total ban on bacteriological (biological) and toxin weapons. Destruction of any such weapons	None	d/	Consultations (art. V). Lodging of complaint with Security Council (arts. VI, VII)	See col. (6). Role in connection with review conferences. Also, role in the exchange of information with regard to art. V f/

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Table (continued)

Name of agreements a/	Signed (1)	Entered into force (2)	Objective (3)	Specific verification provisions (4)	Verification methods (5)	Compliance procedures (6)	United Nations role (7)
Environmental Modification Convention	1977	1978	Prohibit military or any other hostile use of environmental modification techniques	Art. V	d/	Consultation/co-operation procedure, including Consultative Committee of Experts. Lodging of complaint with Security Council (art. V); review conferences (art. VIII)	Secretary-General is sole depositary, and Chairman of Consultative Committee of Experts. See col. (6). Also, role in connection with review conferences
Agreement on the Moon and Other Celestrial Bodies	1979	1984	Govern the activities of States on the Moon and other celestial bodies	Art. 15	General on-site inspection with respect to the Moon and other celestial bodies, using own means, or with the assistance of any other party, or through international procedures	Consultations. Settlement of disputes by peaceful means, with or without assistance of Secretary-General (art. 15). Review conferences (art. 18)	Secretary-General is sole depositary. Secretary-General to receive information from States parties carrying out activities (various articles). Settlement of disputes with assistance of Secretary-General. See col. (6). Also, specific role in connection with review conferences
Certain Conventional Weapons	1981	1983	Prohibit or restrict use of certain conventional weapons which cause unnecessary suffering or have indiscriminate effects	None g/	None	Review conferences (art. 8)	Secretary-General is sole depositary
B. Regional multilateral agreements							
Treaty of Tlatelolco	1967	h/	Establish a nuclear-weapon-free zone in Latin America	Arts. 12-16	IAEA safeguards. Special inspections by IAEA or regional organs	Various measures (art. 20). ICJ settlement (art. 24)	Reports to Security Council and General Assembly, through Secretary-General, in connection with inspections (art. 16) and in the event of violations of the Treaty (art. 20)
CSCE: Document on CBMs and certain aspects of security and disarmament	1975	i/	Increase stability and security in Europe	Sect. I	Prior notification of major military manoeuvres and movements. Exchange of observers (sect. I)	Observation on a reciprocal basis. Confidence-building measures (sect. I)	

Table (continued)

Name of agreements a/	Signed (1)	Entered into force (2)	Objective (3)	Specific verification provisions (4)	Verification methods (5)	Compliance procedures (6)	United Nations role (7)
Treaty of Rarotonga	1985	1986	Establishment of a nuclear-free zone in the South Pacific	Arts. 8-10	Reports and exchange of information. IAEA safeguards	Consultations (arts. 8 and 10); Consultative Committee (art. 10). Complaints procedure (art. 8)	
Document of the Stockholm Conference	1986	j/	Strengthen confidence and security and make progress towards disarmament in Europe	Section on compliance and verification and other relevant sections of the Document	Prior notification and observation of certain military activities. National technical means; inspection	Timely clarification, communications, etc.	

Source: Based on 1988 United Nations Disarmament Yearbook, chap. V, pp. 138-142.

* Inclusion of this table does not necessarily imply endorsement of its contents by members of the Group of Experts.

a/ In abbreviated form. The full name is given in the glossary.

b/ For each signatory as from the date of deposit of its ratification; accessions take effect on the date of the notification of the depositary government.

c/ Pursuant to General Assembly resolutions 35/144 C of 12 December 1980, 36/96 C of 9 December 1981, 37/98 D and E of 13 December 1982, 38/187 C of 20 December 1983, 39/65 E of 12 December 1984, 42/37 C of 30 November 1987 and 43/74 A of 7 December 1988. See also Security Council resolutions 582 (1986), 612 (1988) and 620 (1968).

d/ The treaty text makes no provisions for agreed methods of verification. It was understood by the parties that any verification that might be possible would be carried out using national technical means.

e/ In accordance with decision made by States parties at the third review conference of the Treaty held in 1989 and request contained in General Assembly resolution 44/116 O of 15 December 1989.

f/ See paras. 518-521 for relevant description.

g/ Several States have expressed their concern regarding the lack of verification provisions and procedures for dealing with compliance with the terms of the Convention. Some of those States reserved the right to make proposals to that end, should that prove to be necessary, at a later date.

h/ For each government individually.

i/ In the Helsinki Final Act, of which the Document forms a part, the participants declared their resolve, "in the period following the Conference (CSCE), to pay due regard to and implement the provisions of the Final Act of the Conference". The Final Act is not eligible, in whole or in part, for registration with the Secretariat under Article 102 of the Charter of the United Nations, as would be the case were it a matter of a treaty or international agreement.

j/ The measures adopted in the Document are politically binding and came into force in 1987.

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2. Exchange of information in connection with the Biological Weapons Convention

123. As can be seen in the table, although the Biological Weapons Convention does provide for certain measures aimed at addressing the issue of compliance, there are no specific provisions for verification arrangements. Already in 1980, at the First Review Conference of the Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, concern was expressed by States parties as to the need for strengthening the Convention.

124. One such concern was reflected in the decision made on that occasion by the States parties in connection with article IV of the Convention. By that article, each State party agrees to take any necessary measures, in accordance with its constitutional process, to prohibit and prevent any acts or actions which would contravene the Convention. In this connection, the First Review Conference invited States parties which had found it necessary to enact specific legislation or take other regulatory measures relevant to article IV to make available the appropriate texts to the United Nations Department for Disarmament Affairs (then Centre for Disarmament), for the purposes of consultation.

125. With regard to article V, which provides for consultations and co-operation among States parties in solving problems relating to the objective or the application of the provisions of the Convention, the Conference noted the concerns and differing views expressed on the adequacy of the article and the need for the issue to be further considered at an appropriate time. At the Second Review Conference of the Convention, in 1986, that concern was voiced even more strongly and, as a result, a number of decisions aimed at strengthening the authority of the Convention were made by the States parties. Within the framework of article V, States parties were called upon: to exchange data on research centres and laboratories involved in permitted biological activities directly related to the Convention; to exchange information on all outbreaks of infectious diseases and similar occurrences; to promote contacts between scientists engaged in biological research directly related to the Convention, as well as to encourage publication of the results of such research.

126. The Conference further decided to convene an ad hoc meeting of scientific and technical experts from States parties to finalize the modalities for the exchange of information and data as agreed upon in the Final Declaration of the Conference. By its resolution 41/58 A of 3 December 1986, the General Assembly gave the Secretary-General the mandate to assist in the implementation of the relevant parts of the Declaration. Four exchanges of information have taken place to date, one before the ad hoc meeting and three after the experts had adopted an appropriate questionnaire to facilitate such exchanges. In 1987, 16 States parties provided information and data to the Department for Disarmament Affairs which, in turn, circulated it among the parties to the Convention. In 1988, 22 States parties participated in the exercise already using the questionnaire; in 1989, 19 States parties participated; and, as at July 1990, 23 States parties had replied to the Secretary-General's latest note verbale on the issue.

3. The safeguards system of the International Atomic Energy Agency

127. The objectives of the International Atomic Energy Agency (IAEA), according to article II of its Statute, are to seek "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world" and "to ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose". Article III authorizes the Agency, *inter alia*, "to establish and administer safeguards designed to ensure that special fissionable and other materials, services, equipment, facilities, and information made available ... are not used in such a way as to further any military purpose". The article also specifies the circumstances in which IAEA safeguards may be applied: where the Agency itself is the source or channel of assistance; where the parties to a bilateral or multilateral arrangement request Agency safeguards to be applied; and where a State unilaterally submits itself to Agency safeguards.

128. The Statute itself does not require IAEA Members to submit to safeguards but it establishes a framework for the conclusion of safeguards agreements between the Agency and member States. The legal obligations to submit to Agency safeguards under such agreements are to be found in other legal instruments: bilateral agreements between nuclear suppliers and recipients and multilateral treaties of global or regional scope. The IAEA has, through the years, acquired additional responsibilities as a function of its role in connection with arms limitation agreements. Three agreements require the use of IAEA safeguards from their States parties - the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the Treaty for the Prohibition of Nuclear Weapons in Latin America (Tlatelolco Treaty) and the South Pacific Nuclear-Free Zone Treaty (Rarotonga Treaty). The actual application of safeguards under obligations undertaken in bilateral agreements and multilateral treaties is conducted on the basis of safeguards agreements negotiated between the Agency and the safeguarded States.

129. All Agency safeguards agreements are similar in the sense that implementation of the agreements provides evidence, as a confidence-building measure, that the country which has voluntarily "invited" the application of these safeguards is abiding by its obligations. Other similar or common features are that all Agency safeguards agreements contain undertakings by the Agency to:

(a) Avoid hampering a State's economic and technological developments;

(b) Avoid undue interference in a State's peaceful nuclear activities;

(c) Carry out its functions in a manner consistent with prudent management practices;

(d) Protect commercial and industrial secrets and other confidential information by restricting its dissemination, according to practices agreed upon by both the State and the Agency.

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130. The technical objective of safeguards agreements under the NPT system is "the timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other explosive devices or for purposes unknown, and deterrence of such diversion by risk of early detection" (para. 28, INFCIRC/153 corrected). Parties to the NPT have expressed their conviction that IAEA safeguards provide assurance that States are complying with their undertakings and assist States in demonstrating this compliance. Safeguards thereby promote further confidence among States and, being a fundamental element of the Treaty, are regarded by parties to the Treaty as helping to strengthen their collective security.

131. Safeguards agreements concluded under the NPT safeguards system require the State to establish and maintain a national system of accounting for and control of nuclear materials within its territory, jurisdiction or control. It is the responsibility of the State to ensure that plant operators comply with the requirements of the safeguards agreement.

132. Safeguards practices are designed to verify - that is, to establish the truth of - statements regarding the amounts, presence and use of nuclear material or other items subject to safeguards as recorded by facility operators and as reported by the State to IAEA. The safeguards system, in carrying out this process of material accountancy, uses the following basic concepts to verify information supplied by a State:

(a) Audit of records and comparison of the State's reports to the Agency with the records kept by the State;

(b) Verification of the inventory and flow of source and special fissionable material by the use of instruments and other techniques at certain strategic points;

(c) Periodic closing of material balances by the taking of physical inventories and their verification;

(d) Containment and surveillance as important complementary measures to materials accounting.

133. The NPT safeguards system includes three types of inspections. Routine inspections are made to verify the information contained in the reports submitted by the State; ad hoc inspections are made to verify information submitted by States on the design of new nuclear facilities; and special inspections are carried out when unusual circumstances occur, or when there is a need to supplement information collected by routine inspections. To make inspections more effective, IAEA is increasingly using safeguards instruments for non-destructive analysis, and containment and surveillance devices. These devices survey and record movements of nuclear material in plants between inspections - e.g., by automatic cameras that run for several months and take pictures at short intervals and by similarly programmed TV cameras and recorders. IAEA also makes use of tamper-resistant seals to seal off stores of nuclear material between inspections or to seal the cores of the reactors themselves.

134. As at 31 December 1988, there were a total of 920 installations in 57 States under safeguards or containing safeguarded material. IAEA safeguards activities, in 1988, resulted in 2,128 inspections. Some 15,500 seals applied to nuclear material or Agency safeguards equipment were detached and subsequently verified at the Agency's headquarters. About 1,170 plutonium and uranium samples were analysed, with some 3,040 analytical results being reported. To accomplish this, the total safeguards budget of the IAEA amounted to $US 51 million in 1988 (at 1989 price levels) and was almost $US 53 million in 1989. These figures include the salaries and costs of almost 200 inspectors together with research, development, information handling and supporting staff of another 280 individuals at the Agency's headquarters and the specialized safeguards instruments used by the inspectors in the field.

135. IAEA has stated that if all civil nuclear activities in all nuclear-weapon States were brought under IAEA safeguards, a very substantial increase in the IAEA budget would be necessary. Estimates by the Government of Sweden presented in September 1989 at the second session of the Preparatory Committee for the Fourth Review Conference of the NPT suggest that, in such a case, the Agency's safeguards budget would have to be doubled.

136. In operating its safeguards system, the IAEA has acquired valuable experience in ensuring the non-diversion of nuclear material from peaceful purposes as well as in handling inspection procedures. This experience has been drawn upon in designing verification régimes for various agreements and could be of considerable value in devising future verification régimes.

D. Other activities related to existing agreements

1. The Secretary-General's investigative role in connection with the alleged use of chemical weapons

137. Although the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare (Geneva Protocol) contains no specific provisions regarding verification arrangements, allegations of use of chemical warfare have been made from time to time within the context of the United Nations. It was not until 1980, however, that the General Assembly, following yet another series of allegations, adopted a resolution (35/144 C) in which, for the first time, it called upon the Secretary-General to carry out an investigation of such allegations with the assistance of qualified medical and technical experts.

138. In the years that followed, up to 1984, the General Assembly adopted additional resolutions on the subject (see table above) renewing the Secretary-General's mandate, as well as requesting him for further reports. 3/ By then, the reports had evolved also to include lists, provided by Governments, of experts and laboratories upon which the Secretary-General might wish to draw, and several criteria to guide him in investigating the alleged use of chemical weapons. Some of those criteria included procedures in deciding whether or not to initiate an investigation and specific guidance for the conduct of an investigation, including

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procedures for on-site and near-site investigations, standards concerning the collection and handling of samples, and choice of laboratories and procedures for the preparation, transmission and analysis of samples.

139. Allegations of continued use of chemical weapons and concern by the General Assembly over the threat posed to international peace and security by the risk of the use of chemical weapons as long as such weapons remain and are spread led the General Assembly, by its resolution 42/37 C, to renew, in 1987, its request for the Secretary-General to carry out investigations in response to reports by any Member State of the possible use of chemical and bacteriological (biological) or toxin weapons. In addition, the General Assembly requested the Secretary- General, with the assistance of qualified experts, to develop further technical guidelines and procedures available to him for the timely and efficient investigation of such reports of the possible use of chemical and bacteriological (biological) or toxin weapons; to compile and maintain lists, provided by Member States, of qualified experts and laboratories to be drawn upon for the effective discharge of the Secretary-General's investigatory role; to appoint experts to undertake investigation of the reported activities; to make the necessary arrangements, where appropriate, for experts to collect and examine evidence and to undertake such testing as might be required; and to seek, in any such investigation, assistance as appropriate from Member States and the relevant international organizations. The work of the group of experts thereby established by the Secretary-General would last two years.

140. In the mean time, Governments participating in a Conference of States parties to the 1925 Geneva Protocol and Other Interested States on the Prohibition of Chemical Weapons, held in Paris, in January 1989, confirmed their full support for the role of the United Nations, in accordance with its Charter, with respect to the prohibition of chemical weapons. In particular, the participating States reaffirmed "their full support for the Secretary-General in carrying out his responsibilities for investigations in the event of alleged violations of the Geneva Protocol". The participants further expressed their wish for the early completion of the work aimed at strengthening the efficiency of the Secretary-General's investigatory role.

141. The Secretary-General submitted to the General Assembly at its forty-fourth session, in 1989, the report of the group of experts established in accordance with Assembly resolution 42/37 C. That report (see A/44/561, annex), which also contained nine technical appendices, was unanimously adopted by the experts. The Assembly took note of that report in its resolution 44/115 B of 15 December 1989.

142 The experts decided from the outset that central to the task of preparing the guidelines and procedures for the timely and efficient investigation of the alleged use of chemical and bacteriological (biological) or toxin weapons (CBT weapons) was the question of how to ensure the required timeliness in the acquisition of relevant information. In this connection, identifying and defining the conditions that would warrant on-site investigations, as well as obtaining the strongest possible commitment by affected Member States to permit such investigations emerged as the two correlates to the question of timeliness.

143. The Group therefore endorsed the concepts whereby, first of all, an investigation should be made at the site where CBT weapons were allegedly used whenever it was warranted by evaluation of the information provided by a Member State, and secondly, any Member State should authorize such an investigation in its territory when the Secretary-General so requested. The Group recognized, however, that it was up to the Secretary-General and the relevant Member States to agree to the guidelines and procedures. It was thus preferable to formulate them in each case as recommendations only.

144. Among the recommendations made by the Group were the appointment by the Secretary-General of expert consultants to advise and assist him in a consultative capacity whenever necessary and at his request; the establishment of core teams of qualified experts possessing a distribution of the required specialties so as to facilitate training, exchange of information, as well as the timely selection of the experts for a particular investigation; and the carrying out of inter-laboratory calibration in order to evaluate the validity and accuracy of the analytical methods employed by the laboratories designated by Member States.

145. It should be further pointed out that, parallel to the efforts carried out in response to requests by the General Assembly to establish appropriate procedures, fact-finding missions regarding the alleged use of chemical weapons were also carried out by the Secretary-General in response to requests by individual Member States and/or the Security Council from 1984 to 1988. Relevant Security Council resolutions within that period include 582 (1986) of 24 February 1986; 612 (1989) of 9 May 1988; and 620 (1988) of 26 August 1988. The latter is of particular relevance in that it further encouraged the Secretary-General to carry out promptly investigations in response to allegations brought to his attention by any Member State concerning the possible use of chemical and bacteriological (biological) or toxin weapons that might constitute a violation of the 1925 Geneva Protocol or other relevant rules of customary international law, in order to ascertain the facts of the matter, and report the results. By that resolution, the Security Council also decided to consider, immediately, taking into account the investigations of the Secretary-General, appropriate and effective measures in accordance with the Charter of the United Nations, should there be any future use of chemical weapons in violation of international law, whenever and by whomever committed. 4/

E. Other existing activities

1. The standardized instrument for international reporting of military expenditures

146. If the reduction of military budgets on a mutually agreed basis is to be used as a valid approach in the process of disarmament, certain factors would be of great value, particularly openness of information about military spending and the comparability of budgets. The use of a standardized system for the reporting of military expenditures is one of the instruments considered helpful in this connection.

147. Within the framework of the United Nations, the development of a standardized instrument for international reporting of military expenditures can be traced back to the twenty-eighth session of the General Assembly, in 1973, when the question of reduction of military budgets was considered for the first time under a separate agenda item. Pursuant to resolution 3093 B (XXVIII) of 7 December 1973, the Secretary-General, with the assistance of a group of experts, prepared a report (A/9770/Rev.1 of 1974) which noted, inter alia, that a prerequisite for negotiating the reduction of military expenditures was agreement on the scope and content of such expenditures. The questions of developing a standardized system for defining and reporting military expenditures and of verifying compliance with agreements to reduce such expenditures were also discussed.

148. The development of the standardized system for the reporting of military expenditures has therefore been a part of a broad effort by the United Nations to develop a set of specific measures for the purpose of facilitating the reduction of military expenditures. At the same time, as has been stated in several General Assembly resolutions on the subject, the use of the standardized reporting instrument could also be considered as a means of increasing confidence. To that end, wide participation by Member States has been recommended by the General Assembly as essential for the achievement of the most useful results possible.

149. Other General Assembly resolutions and reports of the Secretary-General on the subject, prepared with the assistance of experts, followed in subsequent years. Two reports were of particular relevance in this connection. The first was the report submitted by the Secretary-General to the thirty-first session of the General Assembly (A/31/222/Rev.1 of 1976), which included a definition of the scope and content of military expenditures and a reporting matrix as an instrument for the standardized reporting. The second report, submitted to the General Assembly in 1980 (A/35/479) contained, in addition to an ad hoc panel's report on a practical test of the proposed instrument, the replies of 17 Member States, 14 of which had participated in the testing. Based on the report, one of the recommendations made by the General Assembly in resolution 35/142 B of 12 December 1980 was that all Member States should make use of the reporting instrument and report annually their military expenditures to the Secretary-General for subsequent reporting to the Assembly.

150. In 1981, the first such report of the Secretary-General contained 16 national reports of military expenditures through use of the reporting instrument (A/36/353 and Corr.2, and Add.1 and 2). Since then, annual reports of the Secretary- General have been submitted to the General Assembly. 5/ At the forty-fourth session of the General Assembly, in 1989, 22 Member States reported their military expenditures by using the matrix (A/44/422 and Add.1). In addition, several other reports of the Secretary-General on the question of refining the standardized reporting instrument have been submitted to the General Assembly. 6/

151. Further to the efforts carried out in conjunction with the standardized instrument for international reporting of military expenditures, in 1979, the General Assembly requested the Disarmament Commission to examine and identify effective ways and means for the conclusion of agreements to freeze, reduce or otherwise restrain, in a balanced manner, military expenditures (Assembly

resolution 34/83 F of 11 December 1979). Subsequently, 7/ until 1989, the Disarmament Commission endeavoured to agree on a set of principles that should govern further actions of States in freezing and reducing military budgets. The General Assembly took note of the draft principles 8/ annexed to resolution 44/114 A of 15 December 1989, and decided to bring them to the attention of Member States and of the Conference on Disarmament as useful guidelines for further action in this field.

2. Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and to Identify Seismic Events

152. An Ad Hoc Group of Scientific Experts open to all member States of the Conference on Disarmament, as well as non-member States upon request, was established by the Conference of the Committee on Disarmament (CCD) in 1976. The mandate of the Group was to consider international co-operative measures to detect and identify seismic events. However, the Group was not to assess the adequacy of such a system for verifying a comprehensive test ban. As part of its terms of reference, the Ad Hoc Group has been called upon to work on: further development of the scientific and technical aspects of a global seismic data exchange system; elaboration of instructions for experimental tests of such a system; and co-operation in the review and the analysis of national investigations by States participating in the Group.

153. The first report of the Ad Hoc Group was submitted in 1978 (CCD/558) and described how seismological science could be used in a co-operative international effort to develop a global seismic data exchange system. The report envisaged a network of more than 50 high-quality seismograph stations distributed world wide and operated according to agreed procedures to produce seismic data in standard form on two levels: level I with the routine reporting, with minimum delay, of basic parameters of detected seismic signals; and level II with detailed records of waveforms provided in response to requests for additional information. Level I data would be regularly exchanged using the Global Telecommunications System (GTS) of the World Meteorological Organization (WMO), and such data would be routinely processed at special international data centres (IDCs) for the use of participant States. The much more voluminous level II data would be exchanged only for those seismic events determined by participants to be of particular interest, and no processing of such data at IDCs was foreseen at that time.

154. Over the next several years, the Ad Hoc Group systematically defined the elements of such an international co-operative data exchange system, and elaborated in detail its basic scientific and technical aspects. This work, which was aided by practical co-operative tests of selected parts of the proposed system, was documented in the Group's second and third reports (CD/43 in 1979 and CD/448 in 1984) and culminated with the Ad Hoc Group's first large-scale technical test - GSETT - carried out in 1984, involving the exchange of level I data only; this test was subsequently evaluated and reported on in the Group's fourth report (CD/720 in 1986). Seventy-five seismograph stations in 37 countries took part in the test providing a vast amount of experience, previously unavailable, on many aspects of practical operation of a global seismic data exchange system.

155. Drawing upon the evaluation of the 1984 technical test and recognizing the new possibilities offered by rapid development in seismic equipment, computer processing and communications technology, the Ad Hoc Group agreed in 1986 to direct its future work towards design of a modern international system. In particular, there was a consensus that those technological advances would make it feasible for complete seismic waveforms, i.e., level II data, to be regularly exchanged and processed at IDCs. In their fifth report to the Conference on Disarmament (CD/903 in 1989), the scientific experts described initial concepts for the design of a modern international seismic data exchange system that would have the task expeditiously to provide comprehensive information on seismic events, collected on a global basis and processed according to agreed procedures. Although some States have a different position on a comprehensive nuclear test ban, it is widely considered that a modern international seismic data exchange system could contribute to verification of compliance by its parties with a possible future nuclear-test-ban treaty.

156. According to the Ad Hoc Group, the proposed new seismic data exchange system would be based on the expeditious exchange of waveform (level II) and parameter data (level I) and the processing of such data at IDCs. It would have four major components:

(a) A global network of high-quality seismograph stations, including seismic arrays, each conforming to specified technical standards and operated according to internationally agreed rules;

(b) Government-authorized national data centres (NDCs) responsible for providing agreed seismic data from national stations to IDCs;

(c) International data centres to collect and analyse seismic waveform and parameter data, to distribute the results of these analyses and to make the data readily accessible to all participants. Current plans are to establish a minimum of four IDCs to be located at Canberra, Australia; Stockholm, Sweden; Moscow, Union of Soviet Socialist Republics and Washington D.C., United States of America;

(d) Telecommunications channels for the expeditious exchange of data between NDCs and IDCs, as well as among IDCs.

157. Furthermore, the Ad Hoc Group proposed to conduct a large-scale experiment to collect performance data and experience necessary so that, at the conclusion of the experiment, the Ad Hoc Group can assess the results and thus will have a firm technical basis on which to complete the elaboration of the concepts of a modern global data exchange system. The first and second phases of this large-scale experiment, which is called the Group of Scientific Experts' Second Technical Test (GSETT-2), have been carried out. In the light of experience gained so far, and in order to enable additional countries (21 countries participated in phase 2) to make the necessary preparations, the Group is now planning to carry out the full-scale test (phase 3) in two parts. The first part will be comprised of preparatory testing during the second half of 1990 and the main phase will be conducted during the first half of 1991 (CD/981 in 1990).

3. Other United Nations activities that might be of potential interest for the United Nations role in verification

158. Although not arms limitation and disarmament agreement verification tools *per se*, the peace-keeping operations of the United Nations have, over the years, acquired an extensive experience in certain aspects of monitoring. United Nations peace-keeping forces have no enforcement power: they require the co-operation of the parties concerned to fulfil their tasks. They also need the continuing support of States contributing troops and the support of the Security Council is essential. In a very real sense, therefore, such operations are multilateral co-operative measures. Since 1948, when the first United Nations peace-keeping operation took place, there have been 18 such operations, including some 500,000 civilian and military personnel.

159. Deployed in areas where there has been conflict, United Nations peace-keeping forces endeavour to prevent the recurrence of fighting, to contribute to the maintenance and restoration of law and order and a return to normal conditions. By their physical presence in an area, United Nations peace-keeping forces are able to monitor the day-to-day movements and events of human activity. By so doing they are often in a position to exert a steadying influence on an unstable situation and thereby encourage a return of public confidence.

160. On other occasions, by the establishment of observation posts, patrols and inspections, the United Nations forces and observers have been used to monitor the disengagement and separation of opposing troops. The peace-keeping operations and the observation missions have provided experience which is relevant to a future role of the United Nations in the field of verification. This experience relates, *inter alia*, to the number of personnel required, their training and equipment, and the organization of international co-operation in this area.

F. Relevant activities of the Department for Disarmament Affairs and the United Nations Institute for Disarmament Research

1. Department for Disarmament Affairs

161. The role of the Department for Disarmament Affairs derives from the general functions of the Secretary-General as defined in the Charter of the United Nations and developed over the years through resolutions and decisions of the General Assembly and other legislative organs of the United Nations on disarmament matters. As the organizational unit of the Secretariat responsible for disarmament questions, the Department for Disarmament Affairs is called upon, among other tasks, to provide secretarial, administrative and substantive support services to the General Assembly subsidiary bodies dealing with disarmament, to such negotiating bodies as the Geneva Conference on Disarmament and its subsidiary bodies, as well as review conferences of existing multilateral arms limitation and disarmament agreements. For instance, the Department provides assistance to negotiations on a convention banning the development, production, stockpiling and use of chemical weapons, and on their destruction, within the framework of the

Conference on Disarmament's Ad Hoc Committee on Chemical Weapons, which includes a working group on verification, and the Ad Hoc Group of Scientific Experts on Seismic Events also established by the Conference. The work of the United Nations Disarmament Commission has also been supported by the services of the Department, an aspect of which was the work of the Commission on the question of verification, already mentioned above.

162. Another function carried out by the Department for Disarmament Affairs has been the servicing of expert groups assisting the Secretary-General in undertaking disarmament studies such as the present one. A number of United Nations studies have been carried out arising from mandates by the General Assembly on the issue of arms limitation and disarmament. The studies, carried out by the Secretary-General with the assistance of governmental experts, have been instrumental in exploring and identifying areas of common ground between States which might then lead to progress in appropriate negotiations. Several of these studies 9/ have addressed, in the context of broader arms limitation and disarmament issues, aspects relevant to verification in one form or another, for example, the study on a "Comprehensive nuclear-test ban" (A/35/257); the "Comprehensive study on nuclear weapons" (A/35/392, annex); the "Study prepared by the Group of Governmental Experts on regional disarmament" (A/35/416, annex); the "Comprehensive study of the Group of Governmental Experts on confidence-building measures" (A/36/474, annex); the "Study on the implications of establishing an international satellite monitoring agency" (A/AC.206/14); the "Study on All Aspects of the Conventional Arms Race and on Disarmament relating to Conventional Weapons and Armed Forces" (A/39/348, annex); the "Study on concepts of security" (A/40/553, annex); and the 1990 "Comprehensive study on nuclear weapons" (A/45/373, annex. The present study is the first such endeavour to focus mainly on the issue of multilateral verification of disarmament agreements.

163. Another concern of the Department for Disarmament Affairs has been to create informal opportunities for an open and frank discussion of disarmament issues by governmental officials, members of the academic and scientific communities and the public at large, as represented by non-governmental organizations. The purpose of those meetings has been to provide diplomats with a forum, other than the existing multilateral disarmament bodies, for constructive debate, as well as to create an environment conducive to the cross-fertilization of ideas. In the particular case of the question of verification, the following meetings organized by the Department for Disarmament Affairs have been of particular relevance: Regional Conference for the World Disarmament Campaign (Beijing, China, March 1987); United Nations Forum on Chemical Weapons (Geneva, Switzerland, February 1988); United Nations Meeting of Experts on Verification (Dagomys, USSR, April 1988); United Nations Conference on Disarmament Issues (Kyoto, Japan, April 1989); Regional Conference for the World Disarmament Campaign (Dagomys, USSR, June 1989). In addition, the Department co-operated in the organization of the "Pugwash Symposium on Scientific and Technical Aspects of Development of New Weapons, Verification Issues, and Global Security" held at United Nations Headquarters, in May 1988.

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2. Research activities in the field of verification carried out by the United Nations Institute for Disarmament Research

164. The issue of verification has been in the research programme of UNIDIR for several years. The number of projects and publications in this area has increased recently in view of the growing attention given to these problems by the international community, as well as the new developments in the relevant negotiations and recent agreements. The programme of work of UNIDIR in the field of verification research has concentrated on three areas: verification procedures contained in agreements and treaties currently in force; national positions and attitudes in negotiations concerning verification; and technical and technological problems of verification.

165. Within these three areas of concern, monographs 10/ have been prepared on a legal approach to verification; verification questions relating to the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles; the related subject of confidence-building measures; and the verification issue in United Nations disarmament negotiations. The latter addresses the different negotiations carried out under the auspices of the United Nations or with its co-operation and analyses the positions adopted by different countries during the period of elaboration of the main multilateral agreements, as well as current negotiations. The subject of verification was also one of the themes addressed at conferences organized by UNIDIR in Baku, USSR (2 to 4 June 1987) and Geneva, Switzerland (23 and 25 January 1989).

166. Currently, UNIDIR is preparing, with the assistance of a group of consultant experts, a report on the verification of current agreements on arms limitation and disarmament - ways, means and practices. This report will present a systematic classification of methods and practices of verification, as well as an analytical study of the procedures envisaged by each treaty or agreement and their implementation. A second stage of this project will follow with a view to addressing different verification proposals made in connection with ongoing arms limitation and disarmament negotiations. In addition, two projects are under way which will provide a better understanding of individual national positions in the field of verification and their evolution. 11/ In the area of verification technology, projects on verification by airborne means, 12/ verification of conventional arms limitation and the role of new technologies in the field of verification are also being prepared.

Notes

1/ General Assembly resolution S-10/2.

2/ *Official Records of the General Assembly, Forty-third Session, Supplement No. 42* (A/43/42).

Notes (continued)

3/ For the reports of the Secretary-General see A/36/613 of 20 November 1981; A/37/259 of 1 December 1982; A/38/435 of 19 October 1983; and A/39/488 of 2 October 1984.

4/ Detailed information on those investigations can be found in the following notes of the Secretary-General to the Security Council: S/16433 of 26 March 1984 (also issued as A/39/210 of 27 April 1984); S/17127 and Add.1 of 30 April 1985; S/17911 and Add.1 and 2 of 12 March 1986; S/18852 and Corr.1 and Add.1 of 8 May 1987; S/19823 of 25 April 1988; S/20060 and Add.1 of 20 July 1988; S/20063 and Add.1 of 25 July 1988; and S/20134 of 19 August 1988.

5/ See A/37/418 and Corr.1 and Add.1 of 1982; A/38/434 of 1983; A/39/521 and Corr.1 and 2 and Add.1 and 2 of 1984; A/40/313 and Add. 1, 2 and 3 of 1985, A/41/622 and Add.1 and 2 of 1986; A/42/573 and Add.1 of 1987; and A/43/567 and Add.1 and 2 of 1988.

6/ See A/S-12/7 of 1982; A/38/353 and Corr.1 and Add.1 and A/38/354 and Corr.1 of 1983; A/39/399 of 1984; A/40/421 of 1985; and A/41/482 of 1986. The relevant resolutions that requested the reports mentioned in notes 5 and 6 are: General Assembly resolutions 35/142 B of 12 December 1980; 37/95 B of 13 December 1982; 38/184 B of 20 December 1983; 39/64 B of 12 December 1984; and 40/91 B of 12 December 1985.

7/ The relevant resolutions of the General Assembly on this question are: 35/142 A of 12 December 1980; 36/82 A of 9 December 1981; 37/95 A of 13 December 1982; 38/184 A of 20 December 1983; 39/64 A of 12 December 1984; 40/91 A of 12 December 1985; 41/57 of 3 December 1986; 42/36 of 30 November 1987; and 43/73 of 7 December 1988.

8/ For the text of the principles, see *Official Records of the General Assembly, Fifteenth Special Session, Supplement No. 3* (A/S-15/3); see also *Official Records of the General Assembly, Forty-fourth Session, Supplement No. 42* (A/44/42), para. 41.

9/ Study on a Comprehensive Nuclear-Test Ban (A/35/257) (not published as a United Nations sales publication); *Comprehensive Study on Nuclear Weapons* (United Nations publication, Sales No. E.81.I.11); *Study on all the Aspects of Regional Disarmament* (United Nations publication, Sales No. E.81.IX.2); *Comprehensive Study on Confidence-building Measures* (United Nations publication, Sales No. E.82.IX.3); *Study On the Implications of Establishing an International Satellite Monitoring Agency* (United Nations publication, Sales No. E.83.IX.3); *Study on Conventional Disarmament*, (United Nations publication, Sales No. E.85.IX.1); *Study on Concepts of Security* (United Nations publication, Sales No. E.86.IX.1); Comprehensive Study on Nuclear Weapons, 1990 (A/45/373, annex) (not published as a United Nations sales publication).

Notes (continued)

10/ Serge Sur, A Legal Approach to Verification in Disarmament or Arms Limitation, UNIDIR Research Paper No. 1 (United Nations publication, Sales No. GV.E.88.0.5); Serge Sur, Verification Problems of the Washington Treaty on the Elimination of Intermediate-range Missiles, UNIDIR Research Paper No. 2 (United Nations publication, Sales No. GV.E.88.0.7); Victor-Yves Ghebali, Confidence-building Measures in the CSCE: Documents and Comments, UNIDIR Research Paper No. 3 (United Nations publication, Sales No. GV.E.89.0.5); Ellis Morris, The Verification Issue in United Nations Disarmament Negotiations, UNIDIR (United Nations publication, Sales No. GV.E.87.0.4).

11/ Mikhail Kokeyev and Andrii Androsov, Verification: The Soviet Stance: Its Past, Present and Future, UNIDIR (United Nations publication, Sales No. GV.E.90.0.6).

12/ Allen W. Banner, Andrew S. Young and Keith W. Hall, An Introduction to Arms Control Verification by Airborne Systems, UNIDIR (in course of publication).

V. IMPROVEMENTS IN EXISTING ACTIVITIES AND POSSIBLE ADDITIONAL ACTIVITIES

A. Introduction

167. Verification of arms limitation and disarmament agreements is viewed today in a different, more positive light by the international community. The trends towards greater transparency and openness are already having a positive effect on international relations, including their military dimension. A more constructive attitude towards the United Nations by many Member States is also evident. These changes are giving further practical significance to the statement, contained in the Final Document of the Tenth Special Session of the General Assembly, that the United Nations has a central role and primary responsibility in the sphere of disarmament. The United Nations may wish to address the multilateral aspects of effective verification measures with increasing attention, particularly as multilateral negotiations become more important. The present study should be seen in this context. The right to verify compliance with existing agreements lies with the States parties or such organization as may be designated by them. The States parties may also seek assistance and services from the international community and from United Nations organs. Of course, the United Nations cannot and does not seek to impose itself on current negotiations or on established procedures for implementing existing agreements.

B. Assessing the need

168. A point of departure for assessing the need of United Nations involvement in the verification of arms limitation and disarmament agreements should be the fact that it is universally recognized that such agreements should be adequately and effectively verified and that all States have equal rights to participate in the process of international verification of agreements to which they are parties. Verification of compliance with the obligations imposed by an arms limitation and disarmament agreement is an activity that may, inter alia, be conducted by an organization at the request and with the explicit consent of the parties. These are among the 16 principles adopted by the Disarmament Commission and set out in section II above. The fact that the Disarmament Commission was requested to perform the task of establishing such principles is in itself a recognition of the need to engage the United Nations in this matter.

169. A number of issues on the international disarmament agenda have or will have a global application. As no other international organization with comparable status and universal coverage exists in this field, it is appropriate to explore possible contributions that the United Nations might make to the universal and non-discriminatory application of available means of verification. Access to the technical means of verification is very uneven between the States members of the international community. Economic resources and expertise are also very unevenly distributed. It may be possible that in the future some functions and techniques in the verification of different arms limitation and disarmament agreements will

overlap. In this context, the United Nations might also make its contribution to the exploration by States parties of rational use of resources in this domain.

170. The increased importance of multilateral negotiations has several implications that can enhance the role of the United Nations. First, the question of disarmament concerns the peace and security of all States and consequently, as stated in the Final Document of the Tenth Special Session of the General Assembly, all States have the right to participate on an equal footing in those multilateral disarmament negotiations which have a direct bearing on their national security. Secondly, an increasing number of States will wish to have information relevant to ongoing negotiations. Thirdly, States parties will also need expertise in order to play an effective role in the implementation of agreements. An international organization like the United Nations could offer help to all States, in particular to those which do not have the necessary verification capabilities. The United Nations can usefully build on the foundation it has established in serving Member States with the collection of data and the dissemination of information concerning arms limitation and disarmament.

171. The present negotiations of new agreements on a variety of weapon systems would require sophisticated verification provisions as well as the growing co-operation of States in their implementation. In these circumstances, there is an even greater requirement for expertise and information that can help States parties to play a useful role, both in the negotiation and implementation of new agreements.

172. On occasion, concerns over non-compliance have undermined confidence in the effectiveness of a number of existing agreements. Some bilateral agreements have clear provisions and institutional arrangements to address concerns over non-compliance. These begin with the establishment and communication of facts. Other multilateral agreements, such as the 1925 Geneva Protocol, do not. Given convincing evidence of the recent use of chemical weapons, the pressing need to reaffirm agreed prohibitions against such use, and the widely acknowledged utility of the Secretary-General's fact-finding role in this regard, it would be useful to consider ways in which the United Nations role can be enhanced, and whether similar activities by the Secretary-General could be helpful in other areas of arms limitation and disarmament.

173. All these factors make it natural to look for multilateral ways and means of co-ordinating resources in order to use them more rationally and to compensate for asymmetries in capabilities of States in this field. This may also be an important factor in promoting universal adherence to future agreements. No organization other than the United Nations has a better potential to cater to such needs. Whether they could or should be performed within the existing framework, or whether a special body should be established within the United Nations system, will be dependent on the extension of the functions entrusted to the United Nations.

C. Examination of possibilities

174. The following list of possibilities for enhancing the United Nations role in verification collates specific ideas that have been advanced under generic headings. It is not exhaustive; new proposals continue to be advanced. What follows is a descriptive survey of proposals where organizational, technical, operational, legal and financial aspects can be readily assessed, and where short-, medium-, and long-term implications can be considered carefully. Government studies cited in this report are used to illustrate this list of possibilities; the Group does not necessarily endorse these studies.

175. Cost estimates for these proposals will vary as they depend on the tasks at hand, the specific configuration of the equipment employed and the manner of its use. The estimates given below, as made available to the Group, are therefore only illustrative of the magnitudes of sums involved.

1. United Nations capability for data collection

(a) Background and description

176. Verification arrangements for existing accords are built upon data collected by national technical means (NTM), whether unilaterally or in co-operation with others, and by other co-operative arrangements. Increasingly, the access to and availability of data, by data exchanges and other means, have become essential building-blocks for arms limitation and disarmament agreements and for confidence- and security-building measures between States parties. Several types of data might also be beneficial for States that are not parties to existing agreements, and these may be derived from:

(a) Information on the generic verification process (e.g. verification research, methods and bibliographies): as this information is related to research into the development of better methods and approaches, its collection may be directly relevant and beneficial to all States;

(b) Information related to verification procedures and actual compliance with existing arms limitation and disarmament agreements: this information provided or released by some States parties could be relevant as well to States not parties as they consider future participation in the agreements. In order to collect information relating to compliance with a specific agreement the United Nations may require a specific mandate.

177. Greater openness, through the unilateral provision of data, data exchanges and other means, can also help establish conditions so that nations will become inclined to reduce the burdens imposed by the purchase of weapon systems and rely increasingly on alternative arrangements that provide for common security. To this end, information on military budgets, as well as notification and declaration of military activities, may be openly published by some States or provided directly to the United Nations. Expanded data exchanges can help provide the much needed basis

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for confidence- and security-building measures and for the negotiation of future arms limitation and disarmament agreements.

178. In particular, the United Nations could be entrusted with collecting information on military matters pertaining to areas common to all States and with distributing such information to Member States, thus contributing to openness and transparency in such areas. Information of this kind could be of value for States both in their efforts to verify the implementation of current arms limitation agreements applicable to such areas, and generally for their assessment of the status of these areas.

(b) Organizational implications

179. In several ways, the elements of a United Nations data collection service for verification are already coming into place. Data relevant to the Biological Weapons Convention are provided to the United Nations on an annual basis; some Member States have begun to provide the United Nations with data regarding national military expenditures, a process that can be usefully expanded and elaborated upon; a roster of chemical weapons (CW) investigative experts and laboratories is on hand in the Office of the Secretary-General, a practice that could also be expanded to other areas; a primary database on chemical weapons, in connection with the draft convention being negotiated, is being established by the Department for Disarmament Affairs at Geneva; in addition, some States are already contributing national data relevant to the draft CW convention; seismic data are being compiled on a world-wide basis by experts in the field; individual Member States and non-governmental organizations have also compiled comprehensive bibliographies of verification literature and collected material from centres of verification expertise.

180. The United Nations might gather and organize existing information in a structured formal way, make a more concerted and co-ordinated effort to compile, store and disseminate useful data relating to verification, and assign these functions to a specific department or office where appropriate. The elaborate accounting system of the IAEA and its records on facilities covered under the safeguards system provides an example of how such a system, handling specific information in the context of a specific agreement, can help build mutual confidence and security and contribute to verification of arms limitation and disarmament accords.

181. Initially, a United Nations data collection service could begin on a small scale, collecting, compiling, and disseminating material on verification provisions and confidence- and security-building measures. In the absence of a new organization within the United Nations, a clearinghouse function involving basic data could be carried out by an existing United Nations body such as the Department for Disarmament Affairs. Particular effort could be directed at the collection of useful published data additional to that required under existing accords (such as disaggregated data on national military expenditures).

182. Pending the establishment of an effective verification and complaints mechanism for the Biological Weapons Convention, the United Nations data collection service could be provided with additional information by States parties to that

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agreement on certain facilities or activities within their borders that could raise questions concerning compliance. Annual declarations provided to the United Nations on high containment biological research facilities and detailed information regarding the outbreak of diseases, as agreed upon at the Second Review Conference of the Biological Weapons Convention in 1986, could provide the foundation for additional data exchanges in this field. The expertise of the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) might be helpful in this regard.

183. Member States could also provide complete bibliographies of verification-related material published in their countries, as well as copies of such material, where possible. Additional information could be provided by international organizations and agencies with verification responsibilities. Rosters could list the international experts who could respond to verification questions. As there is currently no central repository of verification materials, establishing such a capability and facilitating the provision of such services could be helpful not just for Governments, but also for United Nations officials and researchers in the field.

184. A central repository of published information in the verification field under United Nations auspices could help promote relevant expertise and better understanding of national concerns. It could also clarify areas requiring further investigation. The degree to which such a service would facilitate research would vary, depending upon the research materials available in the United Nations and the extent to which individual States would draw upon it. As collections of data grow over the medium- and long-term, the service could help narrow gaps in knowledge between Member States, providing up-to-date information on current research findings.

185. A distinction should be made between library-oriented activities and an operational exchange of data relevant to confidence-building and treaty verification. Such an exchange may include collecting, compiling and redistributing data obtained, for example, from seismological and radiological measurements and from overhead imagery obtained from satellites and aircraft.

(c) Technical, legal and operational implications

186. The technical difficulties associated with the establishment of a United Nations data collection service do not appear to be great. Computerized data banks would be required, as well as the time and effort associated with inputting and updating all of the data. Legal constraints could arise. If such data collection involved the transmission of data relating to existing accords, the consent of States parties would be required. Operational complications could be minimized by tasking an existing body within the United Nations with the responsibilities of establishing a data collection service. There should be co-ordination in order to minimize costs and duplication should be avoided by appropriate use of data-transmission services between the United Nations organs involved.

187. An operational data exchange is an extensive function, involving large amounts of data, which requires access to experts as well as dedicated computers.

(d) Financial implications

188. Financial obligations that would arise from the establishment of such a United Nations service would depend on the size and functions agreed upon by Member States, and therefore cannot at present be estimated. A United Nations data service would entail additional computer capability and added personnel to carry out assigned tasks. Its size and functions could grow over time with new sources of data stemming from voluntary and agreed procedures, subject to financial constraints.

189. One example of a collection, compilation and dissemination function within the United Nations is the Energy Statistics Unit of the Department of International Economic and Social Affairs of the United Nations Secretariat. This unit is responsible for collecting, compiling and disseminating statistics on energy and related subjects. With two Professional and five General Service staff, it has a regular annual budget of $US 270,000.

2. Promotion of exchanges between experts and diplomats

(a) Background and description

190. The increased complexity of verification techniques means that negotiators have more to learn from one another. The increased complexity of these negotiations means that negotiators also have more to learn from experts, whether from Governments, industry, or non-governmental specialists, such as seismologists. Exchanges between technical experts and diplomatic officials can therefore be quite beneficial, within and across bilateral and multilateral negotiating contexts. They may also be beneficial for both groups: experts can help diplomats address negotiating problems, and diplomats can help experts focus on problems in need of solutions. Ideas, technical approaches, and procedures developed in one negotiation may also have applicability in another.

191. The usefulness of such exchanges can be expanded to inform States not parties to ongoing negotiations. Their participation in informal exchanges on verification might prove helpful in several ways. They might, for example, gain new insights as to how their security concerns can be alleviated through co-operative verification measures under consideration in diplomatic exchanges to which they are not parties. They might also gain sufficient confidence in verification concepts so as to join in multilateral negotiations or existing accords.

192. Exchanges between technical experts and negotiators have been carried out in the context of ongoing negotiations in the Conference on Disarmament on a complete ban on chemical weapons and discussions on a nuclear-test ban and on prevention of an arms race in outer space. Separately, with the co-operation of various Governments, there have been seminars and symposia held on verification issues,

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organized by the Department for Disarmament Affairs and by UNIDIR, as well as United Nations studies on arms limitation and disarmament. Participants in these exchanges have found them to be helpful: technical experts gain a better understanding of negotiating perspectives, and diplomats acquire a "hands on" appreciation of sometimes technically complex negotiating issues.

(b) Organizational implications

193. An expansion of exchange programmes between technical experts and diplomats could help to facilitate verification research, promote international co-operation in the development of verification technology and stimulate progress in ongoing negotiations. It could also help build consensus as to appropriate monitoring methods for difficult verification problems. Such exchanges could be carried out, as at present, within the framework of current negotiations or under United Nations auspices. If carried out under United Nations auspices, exchanges could help build expertise among participants that might be useful over the long-run in the formulation and implementation of verification provisions. This assistance, however, would be provided on a responsive basis, and with the consent of parties involved in the negotiations.

194. The most appropriate activities of the United Nations in fostering exchanges, at least initially, might be to encourage a cross-fertilization of ideas and the inclusion of States that are not parties to ongoing negotiations. Countries in which advanced verification research is under way might be encouraged to host exchanges under United Nations auspices. Presentations during these exchanges might then be published in United Nations publications and logged into a United Nations data bank, to serve as a resource for officials and researchers in the field.

(c) Technical, legal and operational implications

195. Given its existing activities, the promotion of exchanges between technical experts and diplomats need not pose short-term technical, legal, and operational difficulties for the United Nations.

(d) Financial implications

196. Over the long-term, exchanges between technical experts and diplomats under the auspices of the United Nations could expand to the point where additional staff may be required to carry them out, imposing new financial obligations on the United Nations. Financial obligations arising from such exchanges could be alleviated by host country donations and by earmarked financial contributions by Member States.

3. Possible expansion of the Secretary-General's fact-finding activities

(a) Background and description

197. Another possibility for enhancing the role of the United Nations in verification relates to the Secretary-General's fact-finding activities. As explained in detail in section IV above, the Secretary-General currently has a mandate to investigate the alleged use of chemical weapons and bacteriological methods of warfare. For this purpose, he may draw from a roster of qualified medical and technical experts and use the services of laboratories to analyse evidence collected.

198. Fact-finding capabilities may be enhanced either by broadening the scope of the Secretary-General's mandate, or by expanding the means by which the current mandate can be carried out. For example, the Secretary-General's mandate could be extended to cover existing and new agreements on a case-by-case basis, with the consent of States parties. For example, the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, might be a case in point. In order to enhance greater confidence in the Biological Weapons Convention, ways might be studied of building upon the relevant provisions of the Final Declaration of the Second Review Conference of the Convention 1/ adopted in 1986.

199. Fact-finding capabilities could also be enhanced by expanding the roster of qualified experts and by providing them with improved technical and analytical capabilities. Near-term improvements in fact-finding capabilities might include expanded rosters of technical experts for the 1925 Geneva Protocol and provision of improved portable CW monitoring equipment. In all such cases, expansion of the Secretary-General's fact-finding responsibilities would be at the behest of Member States, with the clear purpose of strengthening accords already approved by them. Future agreements, such as the CW Convention, will of course have to be taken into account.

200. In the medium term, Member States might consider expanding fact-finding operations as data exchanges grow or as new agreements warrant. Improved monitoring capabilities, such as portable equipment especially suited for fact-finding missions, could be provided as they are developed by member States. When appropriate, aircraft operating under United Nations auspices could be dedicated to fact-finding missions to ensure timely arrival, or transportation could be provided by Member States. When appropriate, satellite imagery, or that obtained by aircraft, provided with the assistance of Member States or from commercial sources, could also be used in support of fact-finding operations.

201. Over the long term, United Nations fact-finding operations could utilize the supporting services of the United Nations in the field of verification or an international verification system. Further considerations of medium- and long-term improvements, such as the use of aircraft, satellites, and the establishment of an international verification system, are discussed below.

(b) Organizational implications

202. Near-term improvements in the Secretary-General's fact-finding capabilities raise a variety of organizational issues. An expansion of the Secretary-General's means to carry out the existing mandate in connection with fact-finding missions may require greater co-ordination within the United Nations and between the Secretary-General and Member States.

203. Proper care must be taken to ensure that, whatever organizational arrangements would be agreed, they should not hinder the Secretary-General's flexibility to conduct fact-finding missions in a manner most appropriate to the circumstances at hand.

204. As fact-finding tasks might differ substantially from one agreement to the next, separate rosters of experts would be required. Questions concerning the nationalities of individual experts and the composition of expert teams might be raised, suggesting the need for further agreed procedures governing fact-finding missions. In the future, fact-finding operations in connection with armaments and for peace-keeping operations might employ similar procedures, suggesting the need for close co-ordination and oversight.

205. If an expansion of the means to conduct fact-finding missions under the Secretary-General's current mandate, or an expansion of that mandate to new arms limitation and disarmament agreements, does not require new institutional arrangements within the United Nations, organizational implications can be minimized.

(c) Technical, legal and operational implications

206. Contributions by Member States that provide additional technical capabilities to fact-finding teams under the Secretary-General's current mandate are encouraged, as they have no adverse implications. In expanding the Secretary-General's fact-finding mandate it would be appropriate to take into account a number of considerations. An expansion of the mandate to new arms limitation and disarmament agreements would have to be at the behest of States parties and must take place with their expressed consent. It would not substitute for, nor interfere with, direct consultations between States that might be beneficial to address concerns over compliance. The mandate for any new fact-finding activities by the Secretary-General must be created first, and the development of any capability and infrastructure to carry out such activities must be contingent upon having an agreed mandate. New fact-finding mandates should not interfere with existing treaty procedures respecting verification. Any investigation should be carried out in the least intrusive manner possible.

207. Additional difficulties arising from an expanded fact-finding role by the Secretary-General relate to whether such efforts will be useful in confirming violations of existing accords. No inspection team can go to a place when the host nation does not approve. The United Nations would not be able to render this

service unless it was given both the mandate and the capability to perform fact-finding missions.

208. Expanded fact-finding operations could be organized in such a way as to facilitate the resolution of compliance concerns when the facts in question are subject to differing interpretations or when such interpretations may be keyed to political orientations instead of facts.

(d) Financial implications

209. The financial obligations that might arise from an expanded fact-finding role by the Secretary-General could vary greatly. Rosters of experts and qualified laboratories could be expanded at low cost, while providing experts with improved man-portable equipment could entail modest costs. Improved analytical capabilities within national laboratories presumably would be borne by the States parties. Financial obligations arising from such improved capabilities to carry out the Secretary-General's existing mandate could be alleviated by host country donations and by earmarked financial contributions by Member States.

210. Dedicated aircraft to transport fact-finding missions would entail costs for procurement, manning, maintenance, and operation, especially as back-up aircraft and crews might be required. Cost estimates vary greatly, depending upon the tasks at hand, the parameters of aircraft use and the basis for calculating costs. Therefore, the costs presented are for illustrative purposes only.

211. For example, over a five-year period, the direct and fixed operating costs for a fleet of five Gulfstream IV aircraft might average approximately $US 31 million per year. Comparable costs for a fleet of five Boeing 757-200 aircraft might average $US 89 million per year. The capital costs for a fleet of five Dehavilland Dash 8-300 aircraft, modified to carry radar, infrared and optical sensors, is estimated to be approximately $US 84 million. Annual recurring costs for aircraft maintenance, operation, and personnel are estimated to be approximately $US 6 million. A fleet of five EMB 120 Brasilia aircraft would cost approximately $US 38 million. The purchase price of a fleet of five AN-30 aircraft equipped to carry optical mapping cameras is approximately $US 8 million. The purchase of a fleet of five AN-72p aircraft, available in 1992, equipped to carry optical mapping and panoramic cameras, would cost approximately $US 52 million. Costs could be defrayed if other tasks were assigned to these aircraft, such as for peace-keeping operations. Costs could be minimized if Member States donated aircraft for future United Nations verification efforts, or assumed the costs of transportation for specific fact-finding missions. Costs may also be reduced by leasing aircraft and surveillance equipment. Annual leasing costs for two Canadian aircraft and associated sensors are estimated to be approximately $US 8 million. Estimated annual leasing costs for a fleet of five Gulfstream IV aircraft are approximately $US 27 million. Estimated leasing costs per EMB-120 Brasilia aircraft are $US 1 million approximately per year. The costs entailed in providing satellite support for fact-finding missions are discussed below. The costs of such operations must be weighed against their presumed benefits. Increased costs for fact-finding by the Secretary-General would have to be borne through increased

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payments by Member States, through donations in kind, or through greater cost efficiencies or reductions in existing services.

4. Possible uses of aircraft for verification purposes

(a) Background and description

212. As described in section III above, aircraft have several important features that lend themselves to verification purposes. Aircraft can be extremely flexible verification platforms that can be deployed relatively quickly to carry out surveillance over any specified area, subject to the consent of States overflown. Aircraft may also succeed in gathering data at night and under cloudy conditions, whereas satellites usually are not equipped to do so.

213. Aircraft overflights may also be particularly useful for monitoring confidence- and security-building measures. Aircraft overflights can be a means to build mutual trust and transparency between States, making threatening military preparations harder to conceal, allowing them to negotiate more far-reaching arms limitation and disarmament agreements in the future.

(b) Organizational implications

214. The use of aircraft by the United Nations would raise organizational issues regarding agreed procedures and equipment. Aircraft could also be employed in different ways by the United Nations. As a result, management decisions would be required as to how aircraft, associated personnel and equipment would relate to existing and new activities, and whether the control of such operations should be centralized.

(c) Technical, legal and operational implications

215. Aircraft overflights for verification or monitoring purposes, whether for verification of compliance or for greater transparency between States, would require the consent of all parties concerned, including States parties to an arms limitation and disarmament agreement. Suitable procedures and equipment would also have to be agreed upon.

216. The sensors carried on board aircraft for verification purposes can be optimized for different tasks. For example, if the aircraft is appropriately equipped, cameras and/or radars can be employed, depending on weather conditions. Several different sensors can be carried aboard at the same time, depending on the size of the aircraft and the weight of the sensors. The choice of sensors is, of course, primarily a function of the tasks at hand.

217. Aircraft overflights for verification and monitoring purposes have several limitations. Such aircraft can be vulnerable to local conditions or situations of potential danger, necessitating clear rules for these operations. Range

limitations may be of concern, and for large areas to be covered, multiple aircraft would be needed. Operational costs may also be raised by the need for back-up aircraft, crews and maintenance personnel. The composition of flight crews must be satisfactorily resolved. Agreed procedures between flight crews and hosts must be established in advance that are not subject to different interpretations by States parties, although some flexibility will be required to deal with unusual circumstances that may arise during overflights. Consultative arrangements will be needed and corrective measures must be taken when agreed procedures are not adhered to.

218. Aircraft overflights provide opportunities for many States to become more fully involved in the verification process. Many States have thorough training programmes in this regard. Some States have also gained experience in the observation of military exercises by implementing the Stockholm Document. As differences in interpretation of data collected on aircraft overflights might arise, a combination of different methods of verification might be used in order to reduce the possibility of contention.

(d) Financial implications

219. Estimated costs for aircraft operations are described in paragraph 211 above.

220. Financial costs for agreed aircraft overflights could be curtailed by the use of existing aircraft and sensors, some of which may be surplus to current military requirements or may be leased commercially or purchased without any major changes. Member States may be inclined to make these assets available to multilateral efforts to facilitate arms limitation and disarmament. However, even if initial outlays for equipment are minimized, operating costs can be substantial over time.

5. Possible uses of satellites

(a) Background and description

Optical imaging satellites

221. For almost 30 years, only the United States and the Soviet Union have operated moderate-to-high resolution Earth observation satellites. The images emanating from these satellites have served as a tool for various monitoring purposes, including verification of bilateral arms limitation and disarmament agreements.

222. As more States develop the capability to build and launch imaging satellites, new possibilities are created for "Multi-national technical means". In this regard, the French Government proposed in 1978 an international satellite monitoring agency (ISMA), with a view to advancing disarmament efforts and strengthening international confidence and security.

223. As initially proposed, ISMA was to be responsible for collecting, processing and disseminating information secured by means of Earth observation satellites. France proposed that the Agency's mandate include fact-finding and verification of compliance with existing agreements, if States parties were inclined to use its

services. ISMA would have required a centre for processing data, ground stations, and satellites. This proposal was the subject of an in-depth technical, legal, and financial assessment in a United Nations study (A/AC.206/14), as requested by the General Assembly. Ideas have also been advanced for a regional satellite monitoring agency.

224. In 1988, the Soviet Union proposed the establishment of an international space monitoring agency that would provide the international community with information relating to compliance with multilateral agreements in the field of disarmament and the reduction of international tension, and would also monitor the military situation in areas of conflict. This proposal, included inter alia, the idea of joint research and development of such satellites by Member States. It was stated that Soviet launch vehicles and launching-sites could be provided and the flight-control complex and ground data-reception stations belonging to the USSR could provide controlling services.

225. In 1988, the French Government proposed that, as a first step, an agency for the processing of satellite images (APSI) be created. This agency would collect, process, and disseminate data obtained by means of existing civilian satellites, and train photo-interpreters in the technical processing of raw data. APSI could be employed in the service of disarmament agreements, crisis management, or natural disasters. The products of the agency would be made available to its members. France and the Soviet Union have offered to provide or sell imagery from their observation satellites to such an international body.

226. Additional analysis of imaging satellite operations for multilateral agreements has been provided by the Canadian and Swedish Governments. Canada has studied the PAXSAT concept focusing on two applications for multilateral agreements: verification of space objects from space, and space-to-ground verification. Sweden has carried out and published detailed studies of the technical and financial aspects of developing, building, launching and operating a verification satellite. This satellite, "Tellus", is conceived for space to ground monitoring applications.

Radar satellites

227. The utility of optical satellite with sensors only in the visible light spectrum is limited to daylight hours and areas of the globe that are relatively free of cloud cover when the satellites pass overhead. Radar satellites, while they have limited capabilities for use in the search mode over land, are not constrained in this way. They can complement optical imaging satellites and other monitoring tools in certain ways.

228. An illustrative example is the study carried out by the Canadian Government on the feasibility of developing a regional monitoring satellite system applicable to conventional arms limitation and disarmament in Europe (PAXSAT B), based on Western technology commercially available in the next 10 years. According to the study, this system would consist of two synthetic aperture radar satellites with 5-metre resolution orbiting at an altitude of approximately 800 kilometres, plus one spare satellite, ground data-receiving stations and image-processing equipment. The

study states that, in addition, two optical sensing satellites, plus one spare satellite and ground-based equipment would complete the system.

Telecommunications satellites

229. Telecommunications satellites provide reliable and rapid communication links between States, a capability that might prove of importance in various arms limitation and disarmament efforts and in confidence- and security-building measures that help establish the conditions for new disarmament agreements.

230. The United States and the Soviet Union have long relied on satellite communications to provide secure information to each other at the head-of-government level via the Direct Communication Link, or "Hot-Line". These communication links were broadened and strengthened in 1987 with the establishment of Nuclear Risk Reduction Centres to lessen the possibility of direct confrontations through misinterpretation, miscalculation, or accident. The communication link of the Nuclear Risk Reduction Centres is also used to transmit notifications under the INF Treaty and the Ballistic Missile Launch Notification Agreement.

231. As new accords are negotiated requiring large data exchanges, the role of telecommunications satellites in arms limitation and disarmament agreements will become more important. Such data exchanges will be a feature of international co-operative measures to detect and identify seismic events and of the implementation of a chemical weapons convention. In addition, a growing number of States may wish to take advantage of satellite communications for multilateral activities of military conflict risk reduction, including within the framework of the United Nations.

232. The Swedish Government has proposed the establishment of the COMSENS Data Exchange Satellite System to establish an independent channel of communication for the exchange of verification data. The operational system would include two satellites in a near-polar orbit with on-board processors and memory units, linked to international and national data centres. The satellite could be employed for any agreement requiring significant data transfers from observers and sensors in the field. The Swedish proposal is based on a study that underlines that seismic monitoring of a possible future test ban would require significant data transmissions. It further emphasizes that such a communication system would enhance the possibilities of establishing the authenticity of transmitting stations and of the data provided. It would also make it possible to track and identify military and other units equipped with electronic identification devices. The expertise of the International Telecommunications Union might be helpful in efforts for using telecommunication satellites.

(b) Organizational implications

233. As stated in the report of the Secretary-General on ISMA, "The Implications of Establishing an International Satellites Monitoring Agency" (A/AC.206/14, para. 303), no provisions on general international law entail a prohibition for an

international organization to carry out monitoring activities from space. However, a specific mandate would be necessary to charge an international organization, such as the United Nations, with the responsibility of verifying arms limitation and disarmament treaties from space. Such a mandate would presuppose the consent of States parties to these treaties. On the other hand, the use of existing satellites by the United Nations to perform such tasks in relation to non-treaty specific activities would require only a decision by the appropriate organs of the United Nations.

234. Whenever satellites or their imagery are utilized by a multi-national institution, organizational questions will be raised because of the multi-purpose nature of satellite operations. With appropriate resolution, timely receipt of imagery and professional photo-interpretation capabilities, satellites can be useful for monitoring peace-keeping operations, disengagement agreements, crisis diplomacy, confidence- and security-building measures, and arms limitation and disarmament accords. Satellites can also be used in conjuction with electronically "tagged" equipment of relevance in this context. These activities are the concern of different parts of the United Nations system. Management decisions would therefore be required as to how new monitoring capabilities and personnel would relate to ongoing activities. Given the sensitivity of imagery analysis in a multi-national context, such activities would require close supervision by the Secretary-General.

(c) Technical, legal and operational implications

235. There are no insurmountable technical barriers to the development, construction and launch of imaging, radar, and telecommunications satellites; the barriers are mainly political and financial. In the short-term, imaging and radar satellites developed for multi-national verification purposes might have insufficient resolution to assist in verification of compliance with some provisions of arms limitation and disarmament agreements. Over time, however, the development of high resolution satellites appears feasible.

236. The effectiveness of a verification and monitoring system based on the use of observation satellites placed at the service of the United Nations would depend, inter alia, upon the tasks assigned to those satellites, their number, the extent of delay in obtaining imagery, the timeliness with which interested countries would have access to it and their photo-interpretation capacity. It is possible to envisage an initial configuration rather modest in its goals and gradual improvements to be developed in the long term. It might be practicable to start with a small number of satellites, which could subsequently be increased.

237. If the United Nations were to make use of imagery from observation satellites for such tasks as carrying out fact-finding missions on the ground, or implementing arms limitation or disarmament agreements, a cadre of trained photo-interpreters would be needed. In this regard, consideration could be given to the training that might be provided on a voluntary basis by Member States, or by the Organization, to ensure regional balance among the qualified cadre of photo-interpreters.

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238. Beyond the technical processing of raw data, in this context, imagery analysis and judgements as to compliance or non-compliance would be the responsibilities of States parties to the agreement in question, unless the States parties provide such a mandate to the Secretary-General or to an international or regional satellite monitoring agency.

(d) Financial implications

239. The likely costs would depend greatly on the specific configuration of satellite equipment and all associated facilities and support. The estimates given below, as made available to the Group, are therefore illustrative.

240. Swedish experts estimate the costs to establish the Tellus system at approximately $US 400 million (2,500 million Swedish kronor (SKr)), including development, and launch of one imaging satellite and limited ground facilities. The yearly operating costs per satellite are estimated at $US 15 million (SKr 80 million). Four launches could take place over a 10-year period, assuming a four-year life span for each satellite and an overlap between satellites of between one and two years. The 10-year costs for such a system including satellite development and launch, as well as operating costs, are approximately $US 1.7 billion (SKr 9,960 million).

241. A 1990 Canadian review of satellite costs suggests a capital cost of $US 246 million for one synthetic aperture radar imaging satellite, and $US 246 million for one optical imaging satellite. Launching costs for both satellites were estimated to be approximately $US 230 million; two satellites receiving stations would cost $US 11 million. Two image production systems are estimated to cost approximately $US 8 million. Telemetry, tracking and control stations for the satellite system would require an additional $US 33 million, for a total cost of approximately $US 774 million. Soviet launch services, if obtained on a commercial basis, are estimated to range in cost from approximately $US 28 million to $US 58 million, depending on, inter alia, the type of launch vehicle used, the concrete characteristics of the loading, associated facilities and orbital characteristics. The average life-cycle costs of a radar satellite system, as estimated by the Canadian Government, are approximately $US 500 million per year. This figure represents the purchase and operation of two synthetic aperture radar satellites, plus one spare and associated ground equipment. A further $US 500 million per year would be required for the two optical satellites, plus one spare and ground-based equipment. These figures do not include the cost of training photo-interpreters or other personnel costs associated with radar satellite operations.

242. The total cost of developing and manufacturing the COMSENS system of two telecommunications satellites, including the ground control station, was earlier estimated at approximately $US 50 million by the Swedish Government. A more recent cost estimate (January 1990) puts this cost at approximately $US 40 million (SKr 250 million). This includes the launch of the two satellites and the establishment of their ground control station. The yearly cost for the operation and maintenance of the system, essentially its ground control station, is estimated

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at approximately $US 1 million (SKr 6 million). The satellite is designed for a lifetime of about eight years. The additional cost for one satellite (excluding launch) is estimated at $US 8 million (SKr 50 million). The launch cost for one satellite, depending on arrangements, is estimated to be $US 5 million to $10 million (SKr 30 million to SKr 60 million). One issue for consideration is the alternative cost of leasing data communications channels from international or national satellite networks.

243. If Member States are unable to provide additional contributions for satellites, donations in kind would be a means of avoiding the most significant outlays associated with satellite operations by an international body. In the absence of such a body, Member States operating observation satellites could undertake to provide their services, including possible access to their imagery.

6. Possible creation of an international verification system

(a) Background and description

244. The incentive to create an integrated multilateral verification system within the United Nations framework rests in the unique characteristics of the United Nations. The Organization has the capacity to provide impartial observers and experts; it has already done so, for example, in support of regional peace-keeping efforts and to strengthen the 1925 Geneva Protocol. A number of proposals have been made, as already described in section IV above, to create some type of international verification system. Many of these proposals mention the need to utilize available multi-purpose verification techniques.

245. An international verification system might also be tasked by States with facilitating conflict resolution efforts, early warning with regard to emerging crises, or identifying confidence- and security-building measures in regions of the globe that do not now have these arrangements in place. In such cases, the work of an international verification system can lay the basis for new arms limitation and disarmament agreements. Where such arrangements already exist, an international verification system could add new monitoring capabilities or help to establish far-reaching transparency measures.

(b) Organizational implications

246. Some of the ideas raised could constitute services provided by an international verification system within the framework of the United Nations. Services could include, but not be limited to, gathering and distributing data, facilitating research, providing expertise and advice, when requested and when able. Such services could begin in the near-term at a modest level, such as by the collection of data. In due course, more complex and costly organizational responsibilities could be considered, such as operating aircraft overflights and establishing an international or regional satellite monitoring agency utilizing optical, radar and telecommunications satellites.

247. An evolutionary approach might be used to establish an international verification system within the United Nations if a decision was taken on the issue. Such a verification system could start with quite modest equipment and subsequently it could consider more advanced techniques including imagery from aircraft and satellites as well as use of optical, radar and telecommunication satellites. Such an international verification system might also develop institutionally in an evolutionary manner starting with modest international centres and subsequently, when the United Nations has been assigned sufficient verification tasks to justify it, consideration might be given to establishing an appropriate agency within the United Nations system.

(c) Technical, legal and operational implications

248. The United Nations provides an institutional framework as well as the infrastructure to build on existing activities. The Organization has particular potential to be able to provide an integrated multilateral approach to verification of arms limitation and disarmament agreements. The legal authority of the United Nations to play a role in the verification of specific arms limitation and disarmament agreements - whether through an international verification system or more limited arrangements - is dependent upon States parties granting the United Nations such authority.

249. When there are common elements in several agreements in regard to methods, procedures, techniques and approaches to verification and compliance, an integrated approach may also provide certain advantages. It is also conceivable that an international verification system would encompass separate verification units for different arms limitation and disarmament agreements. In either case, the integrated mechanism would have to work in tandem with the different organs and parties to the separate agreements. By means of such a mechanism, an organizational structure would be in place, when new agreements would be concluded, thus facilitating the beginning of verification operations in a timely fashion. The verification experience accumulated in the international verification system would also be useful. Costs could be reduced as overhead and administrative costs would be shared.

250. Some difficulties may arise while contemplating an integrated approach. For example, not all arms limitation and disarmament agreements are negotiated at the same time as confidence-building measures. In principle, not entirely the same set of States may be parties to all agreements. Each specific agreement can, in principle, create a specific mechanism to address the attendant compliance questions. An international verification system that attempts to provide central guidance or authority to diverse undertakings involving different States parties may not always facilitate and encourage further progress toward disarmament. A mandate for an international verification system will need to be carefully formulated in order to meet the concern of States parties about participation by non-parties who do not share the obligations of the agreement in question.

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251. A successful integrated verification system could do much to promote confidence and trust between States, thereby facilitating the achievement of further arms limitation and disarmament measures.

(d) Financial implications

252. The costs associated with the creation of an international verification system would depend entirely upon the wide-ranging nature of its possible functions. At present the few responsibilities in the area of verification of arms limitation and disarmament that have been assigned to the United Nations have been on an ad hoc basis and no substantial financial support has been devoted to them. For instance, only a very small proportion of the resources of the Department for Disarmament Affairs is related to verification issues; the Department's total budget for all its activities is slightly more than $US 5 million per year (some 0.6 per cent of the total annual regular budget of the United Nations). As an illustration of the costs that could be involved in the creation of an international verification system, the current costs of the IAEA safeguards arrangements (see section IV above) amount to almost $US 53 million per year. For the United Nations to acquire the level and amount of verification expertise that would be necessary would involve the commitment of significant financial resources.

Notes

1/ BWC/CONF.II/13, part II.

VI. CONCLUSIONS AND RECOMMENDATIONS

253. A more peaceful international system should have, as one of its main pillars, arms limitation and disarmament agreements that include verification measures in which all States can have confidence. It is now universally accepted that adequate and effective verification is an essential element of arms limitation and disarmament agreements.

254. Verification is a process for establishing whether the States parties are complying with an agreement. The process includes data collection, data analysis, and reaching a judgement on the basis of that information about whether or not obligations under an agreement are being met.

255. The context in which verification takes place is that of the sovereign right of States to conclude arms limitation and disarmament agreements and their obligation to implement them. Verification is conducted by the parties to an agreement, or by an organization at their request.

256. Having identified and reviewed existing activities of the United Nations in the field of verification of arms limitation and disarmament, the mandate of the Group of Experts required it to assess the need for improvements in existing activities as well as to explore and identify possible additional activities, taking into account organizational, technical, operational, legal and financial aspects. The Group's consideration of this part of its mandate is reflected in section V above, which presents a survey of possibilities for enhancing the United Nations role in verification by collating specific ideas under generic headings. The survey is illustrative and not exhaustive. New proposals can be expected in the light of current developments.

257. Taking into account the essential role of verification in arms limitation and disarmament, the Group concluded that the United Nations will need to address the multilateral aspects of verification with increasing attention, particularly with the growing importance of multilateral negotiations.

258. Significant changes in East/West relations have developed in recent years that have enhanced security. The improving situation has established conditions for successful arms limitation and disarmament measures that were once considered remote. A continuation of these trends and further positive developments in other areas of the world cannot but increase confidence and security between States and may lead to more far-reaching steps by the United Nations in the field of verification of arms limitation and disarmament agreements.

259. In considering the role of the United Nations in the field of verification, and in recognition of the complexity of political, organizational, technical, operational, legal and financial aspects involved, the Group agreed that further actions should be considered in the terms of short, medium and longer timescales. The Group recognizes, however, that the dynamic development of the world situation, possible rapid progress of arms limitation and disarmament negotiations, and the growing importance of finding multilateral solutions, may well overtake any current

projections and introduce new schedules and approaches for United Nations involvement in verification.

260. In a world in which mistrust and suspicion have all too frequently been dominant, and progress in arms limitation and disarmament has often been hindered by the absence of mutual confidence between States, the recent and more intense consideration by the General Assembly of the question of verification is a welcome development. In this regard, the endorsement by the General Assembly in 1988 of the 16 principles of verification was a noteworthy achievement (see Assembly resolution 43/81 B of 7 December 1988). The Group believes that this involvement of the United Nations draws upon one of the great strengths of the Organization, namely, its virtually universal membership, and reflects its responsibilities set out in the Charter of the United Nations in the field of international security and disarmament.

261. Just as all States have the duty to contribute to efforts in the field of disarmament and the right to participate in disarmament negotiations, so too is the successful implementation of arms limitation and disarmament agreements in the interest of all States. Verification is, indeed, an essential element in the process of achieving and implementing arms limitation and disarmament agreements. Therefore, the Group sets out below a number of conclusions and recommendations for further action.

A. Data collection capability

262. The Group of Experts agrees that, in the short term, in anticipating further advances in the field of treaty-specific verification, the United Nations can play a useful role in making research and data relating to co-operative arrangements and verification available to wider audiences. A United Nations data collection capability could assist governmental experts and negotiators on verification provisions and confidence- and security-building measures. This impartial and non-discriminatory capability would facilitate their work and help to lay the foundation for their eventual involvement in future negotiations or existing multilateral agreements. Such United Nations services should not entail significant new expenditures or the creation of new bodies. Voluntary contributions, on an objective and non-discriminatory basis, can be made by Member States; these could include bibliographies and existing published materials by Member States, including the provision of rosters of experts and organizations to whom questions could be addressed and with whom verification research projects could be discussed.

263. The Group recommends that the United Nations, through the Department for Disarmament Affairs, develop a consolidated data bank of published materials and data provided on a voluntary basis by Member States on all aspects of verification and compliance. The data bank might include, *inter alia*: the history of negotiations and treaty compliance; procedures for verification and monitoring; information on techniques and instrumentation for verification and monitoring; lists of contacts and experts on verification and addresses of institutions, organizations, companies and individuals which can provide expertise, technologies,

advice on aspects of verification, bibliographic information and data - including data connected with the Biological Weapons Convention and the future chemical weapons convention.

264. The Group also recommends that the United Nations should make the data easily accessible to all Member States, by regularly publishing the lists and additions in the data bank. For instance, the United Nations Disarmament Yearbook could cover, by way of dedicated chapters, the range of data, in particular new developments, held in the data bank. Special reports, with a wide circulation, could be prepared as a result of data collected by the United Nations. Particular emphasis might be given to the use of computers for data storage and retrieval, on-line data access, devices for mass data storage and interfacing with relevant data bases to which Member States provide access.

265. The Group recommends that the United Nations should take an active part in facilitating the operational international exchange of data contributing to treaty verification upon request of States parties and to confidence-building.

266. In this context, the Group discussed whether such an exchange could include the collection, compilation and distribution of data obtained by a variety of means such as may be appropriate to the requirements of a future treaty or treaties. Included among the issues discussed were seismological and radiological measurements, overhead imagery obtained from satellites and aircraft, and the proposed agency for the processing of satellite images (APSI). It is not for the Group to pass definitive judgement on these issues, as decisions on them should be left to the appropriate multilateral forums.

B. Exchanges between experts and diplomats

267. The Group of Experts also agrees that, in the short term, in anticipation of further advances in the field of treaty-specific verification and new agreements increasing confidence and transparency between States, the United Nations can play a constructive role in promoting exchanges between experts and diplomats to help the latter to address negotiating problems, and to help experts focus on needed solutions. Such exchanges can contribute to the creation of general overall awareness of verification issues, enabling States to have a fuller appreciation of the role of verification in alleviating their security concerns. The States may thus also reach a better appreciation of difficult verification problems and of the appropriate monitoring methods for their solution. The exchanges could also promote international co-operation in the development of verification procedures and technology. Responsibility for carrying out a wider exchange programme could be assumed by the Department for Disarmament Affairs. In this regard, the Department could seek co-operation with national institutions as well as international non-governmental organizations and scientific research institutes such as the Pugwash Conferences on Science and World Affairs and the Stockholm International Peace Research Institute (SIPRI).

268. The Group of Experts recommends that the United Nations, through the Department for Disarmament Affairs and, when appropriate, in co-operation with

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UNIDIR, promote workshops, seminars and training programmes on verification and compliance. In addition, it would be useful for the United Nations Disarmament Fellowship, Training and Advisory Services Programme to give increased attention to the subject of verification and compliance.

269. The Group further recommends that the United Nations explore ways to provide expert advice to States, at their request, to establish and implement verification structures, thereby increasing their effective participation in agreements.

270. The Group proposes further that the United Nations, through UNIDIR, increase its support to ongoing multilateral negotiations by undertaking specific research on verification topics, responsive to the needs of those negotiations. UNIDIR could, for example, undertake research tasks that address specified problems encountered during the negotiations. UNIDIR could also continue to commission research into new verification technologies, methods and procedures as well as legal aspects of verification and compliance.

C. The role of the Secretary-General in fact-finding and other activities

271. The Group of Experts believes that the experience gained from the Secretary-General's fact-finding activities could be helpful in connection with certain arms limitation and disarmament agreements that lack explicit verification provisions. It is the Group's view that, in the short-term, the Secretary-General's capabilities may be further strengthened and broadened, provided he is granted a mandate to do so. Such enhancement could be achieved either by broadening the scope of the Secretary-General's capabilities or by expanding the means through which the existing mandate is carried out. For example, the Secretary-General's fact-finding mandate could be extended to cover the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects. Proper care must be taken to ensure that whatever organizational arrangements are agreed upon, they should not hinder the Secretary-General's flexibility to conduct fact-finding missions in a manner most appropriate to the circumstances at hand. The determination of what actions the Secretary-General may undertake to strengthen his fact-finding capabilities will be dependent upon the mandate he is given and must be made on a case-by-case basis.

272. In addition, the complementary role played by bilateral and multilateral arms limitation and disarmament efforts can be further strengthened through the United Nations. To this end, the Group recommends that States parties to future multilateral arms limitation and disarmament agreements should consider depositing those instruments with the Secretary-General of the United Nations, as is the case, for instance, of the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (see General Assembly resolution 31/72, annex, of 10 December 1976) and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (see General Assembly resolution 34/68, annex, of 5 December 1979). In this connection, States parties should also consider providing to the Secretary-General and the General Assembly periodi

reports regarding the implementation of those agreements for subsequent dissemination to all Member States. As has been the case in several multilateral agreements, review conferences could also be organized with the assistance of the United Nations.

D. Use of aircraft for verification purposes

273. The Group of Experts further considered the possible use of aircraft by the United Nations as a verification tool. Such United Nations use of aircraft would of course require the consent and support of States parties to the agreements concerned. Where existing agreements lack thorough verification procedures, aircraft could be used in conjunction with fact-finding missions on the ground. Where established verification procedures already exist, the use of aircraft by the United Nations would require careful co-ordination. The use of aircraft for verification purposes by the United Nations would have significant organizational and financial implications which would require appropriate governmental approval and support. The question of processing the data acquired through the use of aircraft must also be properly addressed. Costs might be reduced if Member States were prepared to donate the use of specialized aircraft for verification purposes on a temporary basis as required. The Group did not pass definitive judgement on this issue.

E. Use of satellites

274. Noting that the use of satellites has played a key role in verifying arms limitation and disarmament agreements and is likely to have continued relevance for the future, the Group of Experts considered the development and launching of a United Nations satellite network for arms limitation and disarmament verification. Such a network would involve not merely providing the necessary satellite hardware but also major investments in acquiring relevant expertise and an image analysis capability. These undertakings would have very great organizational and financial implications. Because of the lead-time required to design, develop and build such a network, the use of its own satellites by the United Nations for arms limitation and disarmament verification appears unlikely, at least in the short-term, unless donations in kind are made by Member States. However, a first step in that direction could be the decision to organize, within the existing architecture, a "clearing house" for data gathered from existing satellites, where training would also be offered in the field of basic photo-interpretation. The Group did not pass definitive judgement on this issue.

F. Towards an international verification system

275. The Group of Experts considered the issue of an international verification system. The same basic reasons which have led to a multilateral approach to certain arms limitation and disarmament questions also raise the issue of a multilateral framework to ensure the verification of resulting disarmament

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agreements. Many nations do not have the means to perform the full range of tasks nor do they have access to the necessary expertise.

276. The Group of Experts considered that the development of a United Nations verification system will depend in large measure on further changes in the political environment and on the verification requirements emerging from continued advances in arms limitation and disarmament agreements. Moreover, the development of appropriate multi-purpose verification techniques would greatly facilitate this process. The development of a United Nations verification organization must be seen as an evolutionary process. There are several possible ways in which an international verification system could come into existence, one of which might be as an "umbrella" verification organization resulting from the co-ordination or merging of two or more future verification systems. The Group did not pass definitive judgement on this issue; however, it recognizes that the subject will continue to be considered in the light of future developments.

277. The present international situation provides the right environment to engender a dynamic multilateralism. Indeed, the present situation and the complexity of the problems faced by the international community suggest the need to develop a system which can cope with the problems of security and disarmament in a multilateral framework. The United Nations is unique in its global scope, its membership and its Charter. The role played by the United Nations in the recent past in addressing crisis situations is a sign that it is likely to be called upon in the coming years to deal with a number of such situations. With the prospect of greater attention being given to achieving multilateral agreements on arms limitation and disarmament, an enhanced United Nations capability to assist in verification, with the consent of all States parties to such agreements, could be a significant contribution to international security and co-operation.

APPENDIX

Selected bibliography on technical aspects of verification

Note by the Secretariat

1. In the course of the discussions of the Group of Qualified Governmental Experts to Undertake a Study on the Role of the United Nations in the Field of Verification, the Secretariat was asked to provide an illustrative bibliography on technical and other aspects of verification to serve as a preliminary listing of source materials and as a first step in a process of data collection.

2. There is already a large quantity of published materials on the subject of verification and the number is growing rapidly. While every effort has been made to present a bibliographical selection that is representative of various viewpoints on the subject, this survey should not be considered as an exhaustive listing of the publications available on the issue of technologies for verification of arms limitation and disarmament. In particular, this preliminary listing does not adequately reflect materials published in languages other than English.

3. The views expressed by the various authors in the publications listed in the present document are solely their own. Inclusion in this selected bibliographical listing does not convey any endorsement of the contents of the publications.

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Remote monitoring techniques

1. Aerial monitoring

Aerial monitoring includes an aircraft directly overflying the area under investigation or flying an aircraft obliquely with sideways-looking instruments.

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1981, C1, An Approach to the Environmental Monitoring of Nerve Agents

1982, B3, Identification of Non-phosphorus Warfare Agents

1983, B4, Identification of Precursors of Warfare Agents, Degradation Products of Non-phosphorus Agents and some Potential Agents

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1985, C2, Air Monitoring as a Means for the Verification of Chemical Disarmament, Part I. Development and Evaluation of Basic Techniques

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4. *Nuclear materials verification*

Tracking and monitoring nuclear materials require technologies which include, *inter alia*, nuclear detectors, tagging technologies and on-site visual monitoring.

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